

**EPA/ROD/R08-92/502  
1992**

**EPA Superfund  
Record of Decision:**

**OGDEN DEFENSE DEPOT (DLA)  
EPA ID: UT9210020922  
OU 03  
OGDEN, UT  
09/28/1992**



**EPA**

# **Superfund Record of Decision:**

Ogden Defense Depot (Oper-  
able Unit 3), UT

## **NOTICE**

The appendices listed in the index that are not found in this document have been removed at the request of the issuing agency. They contain material which supplement, but adds no further applicable information to the content of the document. All supplemental material is, however, contained in the administrative record for this site.



Abstract (Continued)

site investigation, chemical warfare agents, VOCs, including TCE, and heavy metals were detected in the onsite soil samples from the CWA Identification Kit Burial Area. Pressurized gas cylinders with unknown contents were found in the Compressed Gas Cylinder Reburial Area, and bottles containing halzone water purification tablets were found in the Water Purification Tablet Burial Area. In 1991, investigations confirmed that ground water underlying the site was also contaminated by VOCs. The site has been divided into four operable units for remediation. A 1992 ROD addressed the reduction of the principal threat posed by contaminated soil and shallow ground water, as OU4. This ROD addresses the potential threats to future onsite residents and Depot workers posed by contaminated soil and debris, as OU3. Another 1992 ROD will address the contaminated ground water underlying the site, as OU1. The primary contaminants of concern affecting the soil and debris are organics, including pesticides; metals, including arsenic; and other inorganics.

The selected remedial action for this site includes excavating, handsorting, and mechanically sieving 530 cubic yards of contaminated soil and debris from the Chemical Warfare Agent Identification Kit and the Riot Control and Smoke Grenade burial areas; incinerating offsite any debris or soil contaminated by chemical warfare agents or grenade fragments at a DOD facility; excavating soil and debris from the Miscellaneous Items Burial Area, and treating soil and debris that does not meet TCLP treatment standards using solidification, or another appropriate technology prior to disposal in an offsite RCRA landfill along with the untreated debris; returning excavated soil that meets criteria to the excavated areas; excavating and disposing of offsite compressed gas cylinders and the water purification tablet bottles from the Compressed Gas Cylinder and Water Purification Tablet Burial Areas. The total cost for this remedial action is \$393,000. There are no O&M costs associated with this remedial action.

PERFORMANCE STANDARDS OR GOALS:

Chemical-specific soil clean-up goals are based on a future residential exposure scenario, which was calculated under a residential ingestion scenario where a person was assumed to be exposed as a 15 kg child ingesting 200 mg of soil per day for 6 years, and also a 70 kg adult ingesting 100 mg of soil per day for 24 years. These include arsenic 35 mg/kg and mercury 2 mg/kg.



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## Defense Distribution Depot Ogden, Utah

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*Final*  
***Record of Decision and  
Responsiveness Summary  
for Operable Unit 3***

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August 21, 1992



**FINAL RECORD OF DECISION  
AND  
RESPONSIVENESS SUMMARY  
FOR OPERABLE UNIT 3  
DEFENSE DISTRIBUTION DEPOT OGDEN, UTAH**

This is a primary document of the DDOU RI/FS. It will be available in the Administrative Record, which is maintained at the:

Weber County Library  
2464 Jefferson Avenue  
Ogden, Utah

Hours: 10 am - 9 pm (Monday-Thursday)  
10 am - 6 pm (Friday and Saturday)

**August 21, 1992**

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**Defense Distribution Depot  
Ogden, Utah Operable Unit 3**

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***Declaration for the Record of Decision***



## **DDOU OPERABLE UNIT 3**

### **DECLARATION FOR THE RECORD OF DECISION**

#### **Site Name and Location**

Defense Distribution Depot Ogden, Utah  
Ogden, Weber County, Utah  
Operable Unit 3 - Burial Site 3-A, the Water Purification Tablet Burial Area, and the World War II Mustard Storage Facility

#### **Statement of Basis and Purpose**

This decision document presents the remedial action for Defense Distribution Depot Ogden, Utah (DDOU) Operable Unit 3 (OU 3) selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for DDOU OU 3.

The State of Utah Department of Environmental Quality (UDEQ) and the U.S. Environmental Protection Agency (EPA) concur on the selected remedy presented in this Record of Decision (ROD).

#### **Assessment of the Site**

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, and the environment.

#### **Description of the Selected Remedy**

Operable Unit 3 is composed of Burial Site 3-A, the water Purification Tablet Burial Area, and the World War (WW II) Mustard Storage Facility. The remedy for OU 3 addresses the principal threats posed by contaminated soil and debris in these burial areas. The remedy will remove these principal threats by excavating and disposing of contaminated soil and debris.

Because of the variable nature of the materials buried at OU 3, two alternatives have been combined for the soil cleanup. These alternatives apply to different areas of the site. The selected remedy for DDOU OU 3 consists of the following:

- Soil and debris from the Chemical Warfare Agent Identification Kit and the Riot Control and Smoke Grenade burial areas will be excavated, hand sorted, and mechanically sieved. All debris and contaminated soil will be transported off site and placed in a permitted Resource Conservation and Recovery Act (RCRA) hazardous waste (Subtitle C) landfill. Any debris or soil contaminated by chemical warfare agents or grenade fragments will be

destroyed by incineration at a Department of Defense facility. All soil meeting remediation criteria will be replaced in the excavation.

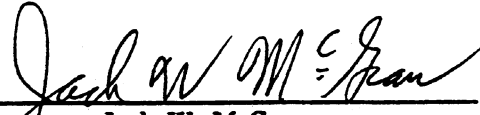
- Soil and debris from the Miscellaneous Items Burial Area will be excavated and transported off site for disposal in a permitted RCRA hazardous waste (Subtitle C) landfill. Soil that does not meet treatment standards will be treated before placement in the landfill.
- The compressed gas cylinders from the Compressed Gas Cylinder Reburial Area will be excavated and disposed of by a commercial operator.
- The water purification tablet bottles from the Water Purification Tablet Burial Area will be excavated and transported off site for disposal in a permitted RCRA industrial waste (Subtitle D) landfill.

The selected alternative will eliminate potential future exposure and risks associated with contaminated soil and debris at OU 3.

### **Statutory Determinations**

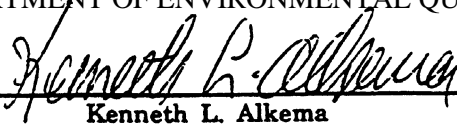
The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and treatment technologies, to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. However, because treatment of all the principal threats of the site was not found to be practicable, the element of the selected alternative that involves disposal of soil and debris in a RCRA hazardous waste landfill does not satisfy the statutory preference for treatment. Technical infeasibility and no identified hot spots preclude a remedy in which contaminants could be treated. No soil will remain on-site with contaminant concentrations above health-based levels, and therefore no five-year review will be required.

UNITED STATES ENVIRONMENTAL  
PROTECTION AGENCY

By:   
Jack W. McGraw  
ACTING REGIONAL ADMINISTRATOR

Date: 9/28/92

STATE OF UTAH  
DEPARTMENT OF ENVIRONMENTAL QUALITY

By: 

Kenneth L. Alkema  
EXECUTIVE DIRECTOR,  
UTAH DEPARTMENT OF  
ENVIRONMENTAL QUALITY

Date: SEPT. 22, 1992

DEFENSE DISTRIBUTION DEPOT OGDEN, UTAH

By:   
M. D. Curry, CAPT., USN  
COMMANDING OFFICER

Date: 9/28/92

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**Defense Distribution Depot  
Ogden, Utah Operable Unit 3**

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***Decision Summary for the  
Record of Decision***

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## **DDOU OPERABLE UNIT 3**

### **DECISION SUMMARY FOR THE RECORD OF DECISION**

#### **1.0 SITE NAME, LOCATION, AND DESCRIPTION**

The Defense Distribution Depot Ogden, Utah (DDOU) is located at 1200 South Street and 500 West in the northwest part of the City of Ogden, Weber County, Utah as depicted in Figure 1. The DDOU facility has been a key installation in the Department of Defense (DOD) supply system since September 15, 1941.

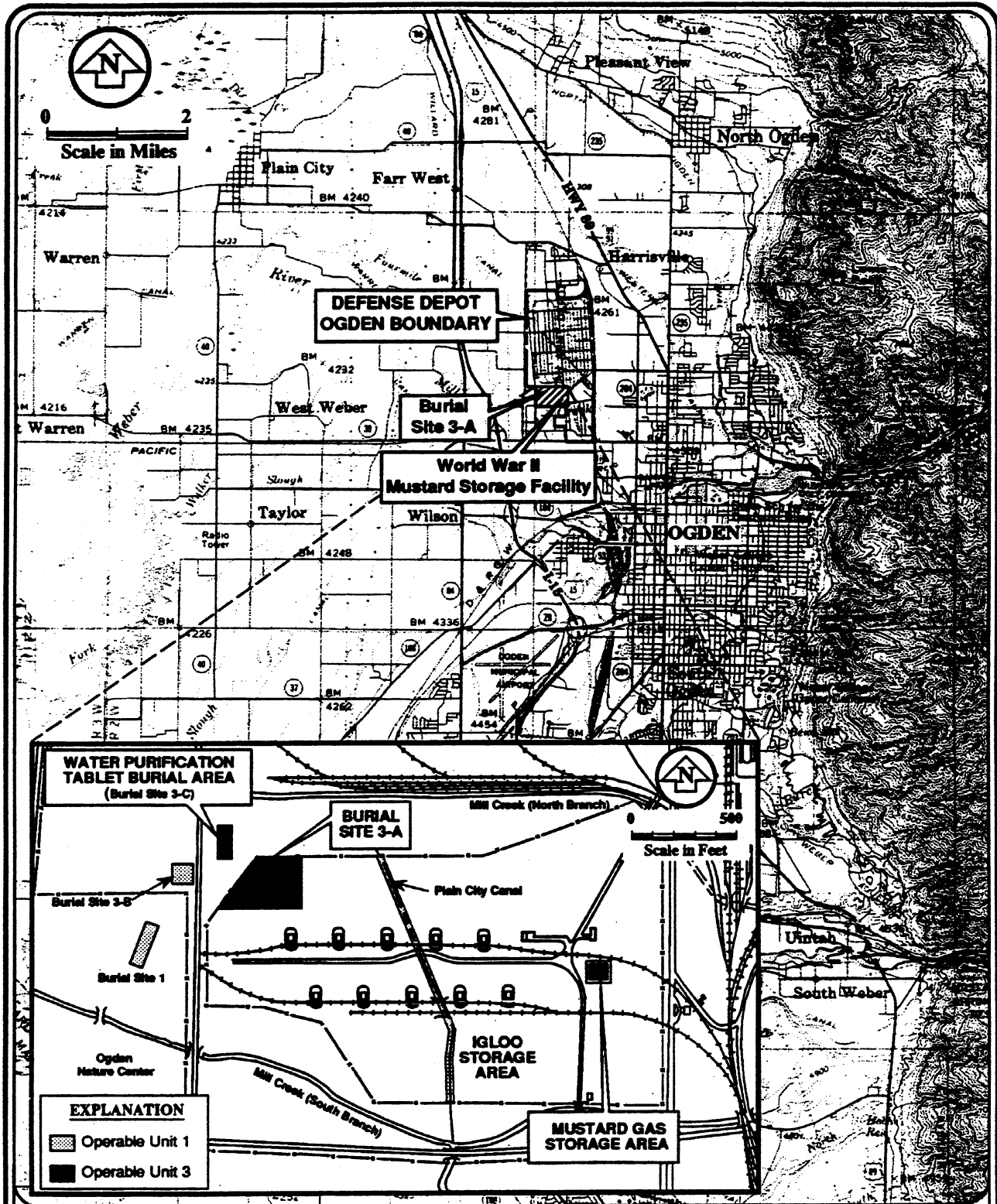
DDOU covers approximately 1,100 acres in the Great Salt Lake Valley and is situated in a semi-rural setting with the small communities of Harrisville (population 2,500) located 1.5 miles to the north, Farr West (population 1,750) three miles to the northwest, and numerous small ranches and a few small businesses located to the west, east, and south. Walquist Junior High School is approximately 1.5 miles to the northwest. The nearest off-Depot residences are located about one-quarter mile to the west of Operable Unit 3 (OU 3), and the nearest residential community is about one mile to the east.

Mill and Four-Mile creeks flow from east to west and drain the topographically flat areas of the installation. Branches of Mill Creek flow around OU 3 and drain the southern portion of the Depot. There are no wetlands within OU 3. The Depot is underlain by unconsolidated lacustrine and alluvial deposits of Quaternary and Recent Age.

An unused shallow water table aquifer, ranging in thickness from approximately 20 to 30 feet, underlies DDOU (including OU 3) and is classified by the State of Utah as a Class II Aquifer, a potential future source of drinking water. Ground-water flow in the shallow aquifer underlying OU 3 is toward the northwest. A deeper, confined aquifer has been encountered at a depth of approximately 110 to 125 feet below the ground surface in the northern part of DDOU. Where encountered, this aquifer exhibits strong artesian flow with water levels in the deep wells rising above the ground surface. Regional studies indicate that there may be some hydraulic connection between the shallow and deep aquifers. The strong upward gradient that currently exists could potentially change in the future as a result of excessive pumping of ground water from the deeper aquifers.

In the past, both liquid and solid materials were disposed of at DDOU. Oily liquid materials and combustible solvents were burned in pits, and solid materials were buried, burned, or taken off site for disposal. Several waste disposal areas have been identified on property currently or formerly controlled by DDOU, and divided into four operable units. Two of these contaminated sites (OU 1 and OU 3) are depicted in Figure 1. Under the National Oil and Hazardous Substance Pollution Contingency Plan (NCP), "an operable unit is a discrete part of a remedial action that can function independently as a unit and contributes to preventing or minimizing a release or threat of a release."

Located in the southwest part of DDOU (Figure 1), Operable Unit 3 is composed of Burial Site 3-A, the Water Purification Tablet Burial Area (formerly Burial Site 3-C), and the WW II Mustard Storage Facility. Four distinct burial areas containing diverse types of materials are located within Burial Site 3-A. These areas are: the Chemical Warfare Agent (CWA) Identification Kit Burial Area, the Riot Control and Smoke Grenade Burial Area, the



**DDOU AND OPERABLE UNIT 3  
LOCATION MAP  
FIGURE 1**

Miscellaneous Items Burial Area, and the Compressed Gas Cylinder Reburial Area. Figure 2 depicts the burial areas in and surrounding Burial Site 3-A.

Soil sampling activities have revealed the presence of various chemical compounds and buried debris at OU 3. Chemical warfare agents, semi-volatile compounds, and heavy metals were detected in soil samples collected from the CWA Identification Kit Burial Area. The volatile organic compounds 1,1,2,2-tetrachloroethane and trichloroethene were detected in soil samples from the Miscellaneous Items Burial Area. Chloroacetophenone and N-nitrosodiphenylamine were detected in soil sampled in the Riot Control and Smoke Grenade Burial Area. Pressurized gas cylinders were located in the Compressed Gas Cylinder Reburial Area, and bottles containing water purification tablets were found in the Water Purification Tablet Burial Area. No contaminants were detected in the WW II Mustard Storage Facility.

## **2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES**

### **2.1 SITE HISTORY**

**Burial Site 3-A.** Burial Site 3-A occupies approximately one acre in the northwestern corner of the igloo storage area (Figure 1). The site is enclosed by a 6-foot high chainlink fence topped with strands of barbed wire. Items were buried in Burial Site 3-A intermittently from the early 1950s through the mid 1960s. Materials found during site investigations of Burial Site 3-A include: small glass CWA vials that were found empty, broken, and in some cases intact in buried trenches; riot control and smoke grenades and grenade fragments; compressed gas cylinders, steel cylinders, and an empty 55-gallon stainless steel drum.

**Water Purification Tablet Burial Area.** While not originally part of OU 3, the Water Purification Tablet Burial Area, formerly referred to as Burial Site 3-C, was transferred to OU 3 from OU 1 as a result of its discovery during the 1990 OU 3 site investigation. Bottles of water purification tablets were buried in a single trench oriented northwest to southeast as depicted in Figure 2.

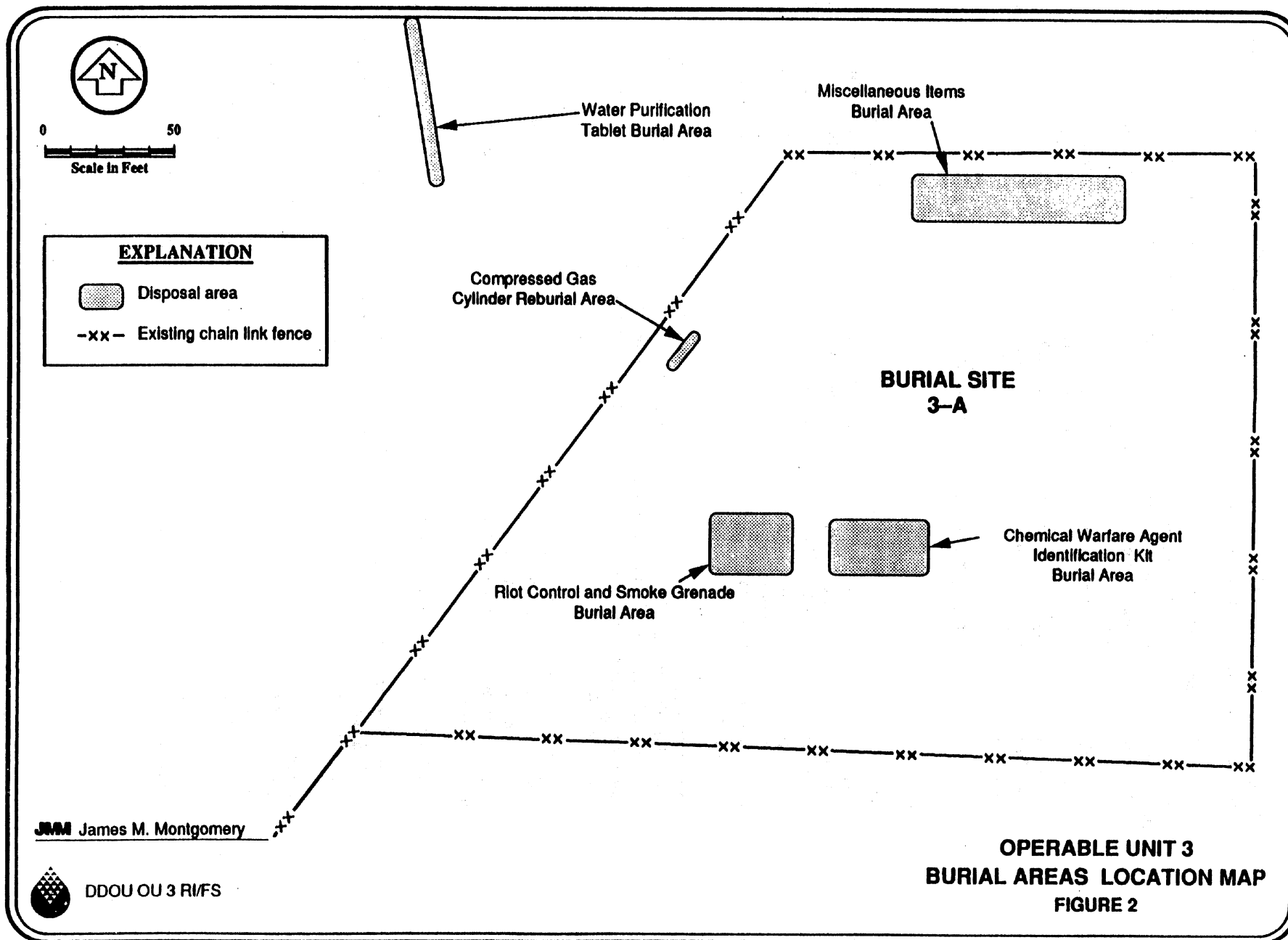
**World War II Mustard Storage Facility.** Over one million pounds of mustard agent were stored at this facility in one-ton containers from 1942 to 1946. The containers were moved to Dugway Proving Ground, Utah, in 1946. Samples collected from the former location of the Mustard Storage Facility confirm reports that “no problems” were ever reported with the mustard containers.

### **2.2 ENFORCEMENT ACTIVITIES**

A records search in 1979 by the U.S. Army Toxic and Hazardous Materials Agency identified locations on DDOU where hazardous materials might have been used, stored, treated, or disposed. These locations were recommended for further study.

Defense Distribution Depot Ogden, Utah was proposed for inclusion on the National Priorities List (NPL) in 1984 and the decision was finalized in July of 1987. As a result, the Defense Logistics Agency (DLA) conducted a study to determine the location of any past disposal sites and the potential for ground-water contamination resulting from those sites.

On June 30, 1986, DDOU entered into a Memorandum of Agreement with the State of Utah Department of Health (which is now the Utah Department of Environmental Quality) and



the U.S. Environmental Protection Agency (EPA) to undertake a remedial investigation/feasibility study (RI/FS) under DOD's Installation Restoration Program.

In November of 1989, DDOU entered into a Federal Facility Agreement (FFA) between DDOU, EPA, and UDOH. The purpose of the agreement was to establish a procedural framework and schedule for developing, implementing, and monitoring appropriate response actions at DDOU in accordance with existing regulations. In response to the FFA, DDOU was divided into four operable units. The FFA requires the submittal of several primary and secondary documents for each of the operable units at DDOU. This ROD concludes all of the RI/FS requirements for OU 3.

## **2.3 INVESTIGATION HISTORY**

From 1981 through 1991, shallow monitoring wells were installed at or near OU 3 to investigate the quality of shallow ground water underlying OUs 1 and 3. Ground water sampled from these wells indicates the presence of volatile organic compounds (VOCs), but chemical warfare agents and thiodiglycol, the primary breakdown product of mustard, have never been detected in the shallow ground water underlying OU 3.

In 1985, a survey of aerial photographs was conducted to delineate waste disposal areas at OU 3. Ground disturbances were identified from photographs dated 1952, 1958, and 1965, primarily in the Burial Site 3-A area. A geophysical survey using magnetics was conducted to confirm the presence of burial areas observed on the aerial photographs.

Twenty-four test pits were excavated in Burial Site 3-A by the U.S. Army Technical Escort Unit (TEU) from mid May to June of 1988 to investigate areas considered suspect based on geophysical investigations, evaluations of aerial photographs, and visual inspections. All CWAs discovered during the investigation were removed, labeled, and shipped by the TEU to the Tooele Army Depot for disposal. A preliminary baseline health evaluation and environmental assessment recommended that additional sampling and analysis of air, ground water, surface water, and soil be conducted in the Burial Site 3-A vicinity.

In November of 1989, another geophysical survey was conducted using magnetics, ground penetrating radar, and electromagnetic induction to delineate buried trenches in the Burial Site 3-A area. Results indicated the presence of several possible trenches in and surrounding Burial Site 3-A.

Additional site characterization activities were conducted in July and August of 1990, including installation of additional shallow ground-water monitoring wells downgradient of the WW II Mustard Storage Facility and Burial Site 3-A. Although VOCs were detected in ground-water samples from the shallow aquifer underlying OU 3, no thiodiglycol or mustard was detected.

Between November 1990 and January 1991, 36 test pits were excavated and sampled at Burial Site 3-A. Soil samples were analyzed for CWAs, VOCs, semi-volatile organics (SVOCs), pesticides, PCBs, metals, and pH. Although soil sample results indicated no CWA contamination, VOCs, SVOCs, pesticides, and metals were present in distinct burial areas within Burial Site 3-A. Six burial areas were identified containing a wide variety of debris. During the same investigation, 14 soil borings were drilled and 20 soil samples were collected for mustard and lewisite analysis in the WW II Mustard Storage Facility. No soil contamination was detected. Air monitoring for CWAs during the test pit excavations in Burial Site 3-A indicated no CWAs were present in the atmosphere during the 1990 investigation.

In June of 1991, one monitoring well was installed and sampled in the Miscellaneous Items Burial Area. A ground-water sample collected from the monitoring well confirmed the presence of VOCs in the ground water beneath OU 3.

## **2.4 COMMUNITY RELATIONS HISTORY**

The RI/FS Report and the Proposed Plan for DDOU OU 3 were released to the public on December 6, 1991 and March 4, 1992, respectively. These documents were made available to the public in both the Administrative Record and an information repository maintained at DDOU and the Weber County Library. The notice of availability for these two documents was published in the *Salt Lake Tribune*, the *Deseret News*, and the *Ogden Standard Examiner* on March 4, 5, and 6, 1992.

A public comment period was held from March 14, 1992 through April 13, 1992 and a public meeting was held on March 26, 1992. At the public meeting, representatives from DDOU, EPA, and UDEQ presented the preferred alternative and answered questions. A court reporter prepared a transcript of the meeting. A copy of the transcript and all written comments received during the comment period have been placed in the Administrative Record. In addition, copies of the transcript were sent to interested meeting attendees. A response to the comments received during the public comment period is included in the Responsiveness Summary, which is in the final section of this ROD. This decision document presents the selected remedial action for DDOU OU 3, chosen in accordance with CERCLA, as amended by SARA and, to the extent practicable, the NCP. The decision on the selected remedy for this site is based on the Administrative Record.

## **2.5 SCOPE AND ROLE OF OPERABLE UNIT 3**

Defense Distribution Depot Ogden, Utah, with concurrence from UDEQ and EPA, has elected to divide the contaminated areas of the Depot into four operable units. The remedial actions planned at each of the four operable units are, to the extent practicable, independent of one another. However, the close proximity of Operable Units 1 and 3 has resulted in some connection between the remedial actions at these operable units. For example, a portion of Burial Site 3-A in OU 3 has been identified as a source of ground-water contamination and the shallow ground water underlying OU 3 will be cleaned up as a part of the OU 1 remedy. Therefore, this OU 3 source area must be cleaned up as part of the remedy for OU 3 to ensure that the remediation goals for ground water at OU 1 can be achieved. The role of the remedial action for OU 3 is to reduce the potential threats to future on-site residents and on-Depot workers posed by contaminated soil by reducing the potential for exposure. The remedy for OU 3 is the fourth and final response action for the DDOU NPL site.

## **3.0 SITE CHARACTERIZATION**

### **3.1 NATURE AND EXTENT OF SOIL CONTAMINATION**

Results of site characterization investigations indicate that no contaminants have migrated from source areas at OU 3 into nearby surface water or air. Ground water underlying the OU 3 area will be cleaned up as part of the OU 1 remedy. Materials or chemicals that may be harmful to humans and the environment have been found in soil within the various burial areas at OU 3. These areas are discussed below.

### **3.1.1. Chemical Warfare Agent Identification Kit Burial Area**

During the 1988 site investigation, vials of CWAs used for training were recovered and removed from this burial area. Although one sample contained the CWAs adamsite at 134 milligrams per kilogram (mg/kg) and mustard at 5,000 mg/kg, this contamination was caused by the release of CWAs from vials that were accidentally broken during the site investigation. Since CWAs are unstable in the environment, they are not normally expected to be present in the soil. Semi-volatile organic compounds (hexachloroethane at 0.55 mg/kg, chloroacetophenone ranging from 2.5 to 2.9 mg/kg, and N-nitrosodiphenylamine at 0.75 mg/kg), and pesticides (delta-BHC at 0.0078 mg/kg and 4,4-DDE ranging from 0.015 to 0.130 mg/kg) were detected in soils during the 1988 and 1990 investigations. Elevated levels of metals including arsenic (559 mg/kg), lead (44.4 mg/kg), mercury (9.8 mg/kg), and barium (ranging from 153 to 248 mg/kg) were also detected. The estimated volume of soil and debris in this burial area is approximately 100 cubic yards, based on a disturbed area of approximately 40 by 22 feet, and a depth of 3 feet. However, it is estimated that only about one percent of this mixture contains debris. The semi-volatile organic compounds are not expected to be mobile, and chloroacetophenone should degrade via hydrolysis. While many variables affect the mobility of the metals, arsenic is likely to be mobile, while the other metals are likely to migrate slowly.

### **3.1.2. Riot Control and Smoke Grenade Burial Area**

Numerous unfused grenades and grenade fragments have been found in this burial area. Chloroacetophenone, a tear gas used in riot control grenades, was detected in one soil sample at a concentration of 170,000 mg/kg. Only one semi-volatile organic compound (N-nitrosodiphenylamine at 0.75 mg/kg) and one pesticide (4,4-DDE at 0.13 mg/kg) were detected. The metals barium (153 to 225 mg/kg), lead (17.1 mg/kg), nickel (19.5 mg/kg), and zinc (55.0 mg/kg) were also detected but at levels near background concentrations, indicating that no metals contamination exists in this burial area. The estimated quantity of soil and debris in this burial area is approximately 90 cubic yards, based on a disturbed area of approximately 33 by 24 feet, and a depth of 3 feet. However, it is estimated that only about one percent of this area contains debris. The contaminants found in this area are relatively immobile, and chloroacetophenone is subject to degradation via hydrolysis.

### **3.1.3. Miscellaneous Items Burial Area**

Numerous CWA detection kits containing no CWAs, World War II gas mask canisters, two one-gallon containers of paint, broken glass, wooden boxes, and pieces of iron were encountered in this area. The VOCs 1,1,2,2-tetrachloroethane (ranging from 0.008 to 0.13 mg/kg) and trichloroethene (0.21 mg/kg) and the metals cadmium (0.63 mg/kg) and zinc (74.5 mg/kg) were detected in soil samples from this burial area. The estimated volume of soil and debris in this burial area is 230 cubic yards, based on a disturbed area of approximately 83 feet by 19 feet, and a depth of 4 feet. It is estimated that approximately 25 percent of this material is debris. Although the VOCs have migrated to the shallow ground water, the metals are much less mobile.

### **3.1.4. Compressed Gas Cylinder Reburial Area**

This area was used to rebury compressed gas cylinders excavated from other burial areas during the 1988 site investigation activities. These items were buried in a 2-foot wide by 15-foot long trench approximately 2 feet below the ground surface. The Compressed Gas Cylinder Reburial Area contains two compressed gas cylinders and four smaller steel



tanks removed from the CWA Identification Kit and Riot Control and Smoke Grenade burial areas. The contents of the cylinders and steel tanks are unknown.

### **3.1.5. Water Purification Tablet Burial Area**

Although a large number of bottles containing halazone water purification tablets were found in this burial area, no contamination was found in the soil surrounding and beneath the bottles. The burial trench is approximately 3 feet wide, 6 feet deep, and 175 feet long. The volume of soil and debris in this burial area is estimated at 110 cubic yards.

## **3.2 PUBLIC HEALTH AND ENVIRONMENTAL IMPACTS**

A baseline risk assessment was conducted for OU 3 following completion of the site characterization activities. The purpose of this assessment was to determine the most significant contaminants present at OU 3, the different ways by which people, plants, and animals could potentially come into contact with the contaminants, and the probability of any harmful effects occurring as a result of that contact. The medium of concern for OU 3 was the soil and debris in the Burial Site 3-A and the Water Purification Tablet burial areas. Because ground water affected by the burial areas has similar contaminants to and is within the contaminant plume of OU 1, the contaminants, the potential exposure, and the potential health risks are addressed as part of the remedy for OU 1.

Results of the health risk assessment for OU 3 indicate that currently there are no complete and significant exposure pathways within OU 3. However, arsenic in the soil in the CWA Identification Kit Burial Area could pose a future chronic risk to human health. In addition, there are three potential sources of acute risks: intact vials of CWA still buried within the CWA Identification Kit Burial Area that could cause an acutely toxic dermal or inhalation exposure; buried halazone water purification tablets could cause adverse health effects if they were ingested in sufficient quantity; and buried gas cylinders could be a physical hazard if punctured, assuming that one or more are still pressurized. No current or future environmental effects are expected to occur as a result of contaminants present at OU3.

### **3.2.1. Contaminant Identification**

The initial step of the risk assessment was the selection of contaminants of potential concern. These consisted of all compounds present above background concentrations with a reasonable potential to cause adverse health affects. Compounds at background concentrations included several metals present at levels expected to be found in uncontaminated soils in the vicinity of DDOU, and the pesticides DDE and delta-BHC, which were present at levels corresponding to an anthropogenic background in agricultural areas. Chemical compounds selected as contaminants of potential concern and their maximum detected concentrations were: arsenic (559 mg/kg), barium (248 mg/kg), lead (44 mg/kg), mercury (9.8 mg/kg), zinc (75 mg/kg), N-nitrosodiphenylamine (0.75 mg/kg), 1,1,2,2-tetrachloroethane (0.13 mg/kg), and trichloroethene (0.21 mg/kg), the CWAs adamsite (134 mg/kg), chloroacetophenone (2.9 mg/kg), and mustard (5,000 mg/kg), and the mustard degradation product thiodiglycol (120 mg/kg). Also included as contaminants of potential concern were chloropicrin, lewisite, and phosgene. Although these CWAs were not detected in soil, they were found in intact vials that were removed during the 1988 investigation.

### **3.2.2. Exposure Assessment**

No current exposure pathways were considered complete. However, a significant potential future exposure to contaminated soil or dust may exist for dust inhalation or soil ingestion by construction workers or future residents. In addition, construction workers or residents could be exposed to three acute hazards: dermal or inhalation exposure to a broken vial of CWA the physical hazard associated with a punctured compressed gas cylinder; or ingestion of halazone tablets.

### **3.2.3. Toxicity Assessment**

Cancer slope factors have been developed for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. Reference doses have been developed for indicating the potential for adverse health effects from exposure to chemicals exhibiting non carcinogenic effects. All conventional carcinogenic compounds had slope factors except for N-nitrosodiphenylamine, which did not have an inhalation slope factor for use in evaluating the risk to construction workers from inhalation of contaminated dust. No reference doses were available for lead, N-nitrosodiphenylamine, or 1,1,2,2-tetrachloroethene; no inhalation reference doses were available for arsenic, trichloroethene, or zinc. Because the remedy for OU 3 was not based on the risk assessment, the values of the reference doses and slope factors and their sources are not presented here.

The toxicity of the CWAs were evaluated qualitatively, with an emphasis on the potential acute effects of each agent. The dose necessary to cause adverse acute health effects was evaluated for halazone tablets by examining both animal and human data in the toxicology literature. Reference doses and slope factors are not applicable to the gas cylinders because the primary concern is a physical hazard. Without knowledge of the contents of the cylinders, the nature of any additional toxic hazard could not be evaluated.

### **3.2.4. Risk Characterization**

Excess lifetime cancer risks are determined by multiplying the intake by the cancer slope factor. These risks are probabilities that are generally expressed in scientific notation (e.g.,  $1 \times 10^{-6}$ ). An excess lifetime cancer risk of  $1 \times 10^{-6}$  indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of chronic site-related exposure to carcinogens over a 70-year lifetime under the specific exposure conditions at the site. The target risk level for a site is  $1 \times 10^{-6}$ , although a value in the range of  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$  may be acceptable.

Potential concern for non carcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient. By adding the hazard quotients for all contaminants within a medium and across all media to which a given population may reasonably be exposed, a hazard index can be generated. A hazard index greater than 1 indicates that there may be a concern for potential health effects, while a hazard index less than 1 indicates that the concern for potential health effects is quite low.

The potential carcinogenic risk to future construction workers who are exposed to conventional contaminants in soils within OU 3 (i.e., not CWAs) is on the order of  $2 \times 10^{-4}$ , while the hazard index was estimated to equal 1. The total hazard index for future adults in a residential soil ingestion scenario was estimated to equal 3, while the carcinogenic risk was estimated to equal  $6 \times 10^{-4}$ . The estimated future carcinogenic risk to children for

this scenario was estimated to equal  $1 \times 10^{-3}$ , and the total hazard index was estimated to equal 10. These are significant risks. They result from the presence of arsenic, which was detected above background levels in the CWA Identification Kit Burial Area, and is believed to be associated with the degradation of adamsite. If arsenic were not present, the potential cancer risks and hazard indices would have been estimated to be less than  $1 \times 10^{-6}$  and 1, respectively, for all scenarios.

For the CWAs, the most severe effects could result from encountering phosgene or mustard. Inhalation of the contents of a single vial of phosgene could cause death, while dermal exposure to a vial of mustard could cause severe, irreversible effects. For the other agents (as specified in Section 3.2.1.), exposure to a single vial would be expected to cause only temporary symptoms such as eye irritation or nausea.

The health effects caused by the ingestion of a bottle of halazone tablets by a small child are uncertain, but could include nausea and vomiting. There is a possibility that the dose would be fatal if a sufficient number of tablets were consumed. It should be noted that the dose of one bottle of tablets is arbitrary. With lower doses (such as a single tablet) the probability of any effects occurring is reduced, as would be the severity of any affects that did occur. Conversely, the likelihood of adverse affects occurring would increase if more than one bottle of tablets were consumed.

Although observations indicate that most of the buried gas cylinders are no longer intact, at least one large cylinder may still contain an unidentified compressed gas. This cylinder may pose a significant physical hazard. The nature of any risk from the toxicity of the contents is unknown.

Based on the following conclusions, no significant environmental threats appear to be associated with OU 3. First, contaminated soil and debris are buried, limiting any potential effects these materials may have on burrowing animals and long-rooted plants. Because CWAs are not expected to accumulate through the food chain, the potential for these compounds to have a significant ecological impact is reduced. Second, the affected area at OU 3 is small, which limits the potential for the site to have an observable impact on the overall ecosystem. Third, there are no receptors for which the potential loss of either a small area of land or a small number of individuals would be considered a significant loss to the overall ecosystem as the area does not serve as critical habitat for plants or animals, endangered species visit the area only occasionally, and those species that inhabit OU 3 are generally not native to the area. Fourth, because CWAs are designed to degrade rapidly in the environment and because conventional contaminants have been detected above background only a small percentage of the time, the average exposure would be much lower than indicated by the maximum concentrations of the contaminants.

### **3.2.5. Uncertainties**

The risk estimates for conventional contaminants were based on the maximum detected contaminant concentrations obtained from a biased sampling design, implying that the risks were overestimated. The total cancer risk and hazard index are primarily derived from arsenic, which was detected at high concentrations only in the CWA Identification Kit Burial Area. While the risks calculated may be representative of this area, they are unlikely to be representative of OU 3 as a whole, or a reasonable area of exposure. Contaminants such as trichloroethene and 1,1,2,2-tetrachloroethane may be present at higher than assumed concentrations, because they were detected in samples where the holding times were exceeded. However, these VOCs were not detected in samples collected at a depth 2 feet below where these compounds were originally detected. Therefore, the

extent of contamination is small, and the average VOC concentration over a reasonable area of exposure would not be expected to be higher than the VOC concentrations used for estimating the potential risk.

Risk characterization of CWAs was based on the assumption that buried intact vials are still present. However, it is unlikely that large quantities of intact vials are still present because Burial Site 3-A has been intensively sampled and all observed CWA vials were removed in 1988. High concentrations of undetected residuals from previously broken vials are unlikely to be present because agents are generally not persistent in the environment. However, the potential to encounter an individual unbroken vial cannot be ruled out.

### **3.2.6. Summary of Site Risks**

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial danger to public health, welfare, or the environment. There are no current significant risks to human health and the environment from exposure to soil at OU 3, nor are significant risks likely to develop in the future as long as the Depot remains in existence. However, there could be a significant potential for both carcinogenic and non carcinogenic health effects to occur should construction workers conduct excavations within the CWA Identification Kit Burial Area, or should adults or children ingest soil from this area. Significant risks may also be associated with exposure to intact vials of CWAs, intact compressed gas cylinders, and bottles of water purification tablets.

## **4.0 ALTERNATIVES EVALUATION**

The selected remedial action must be protective of human health and the environment, be cost effective, and attain Federal and State applicable or relevant and appropriate requirements (ARARs), under Section 121 of SARA. The selected alternative must also use permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable. Remedies that employ treatment that permanently and significantly reduces the mobility, toxicity, or volume of hazardous substances is a statutory preference. This section summarizes how alternatives for remediation of soils at OU 3 were developed, screened, and finally selected.

### **4.1 DEVELOPMENT OF PRELIMINARY ALTERNATIVES**

Preliminary alternatives that represent the range of available remediation options were developed starting with the no-action alternative. Subsequent alternatives represented an increasing degree of technical complexity. Each alternative contains different processes and extent of remediation for soil at OU 3.

The main features of the five preliminary soil alternatives are:

1. **No Action** - No remedial action would be taken to reduce the levels of contamination in the soil at OU 3.
2. **Institutional Controls** - Legal and administrative actions would be taken to limit potential exposure under both current and future use scenarios. Compressed gas cylinders would be excavated, tested, and removed from DDOU.

3. **Containment** - The potential for human exposure and/or contamination of ground water due to soil contamination would be reduced by covering each burial site with a clay cap and controlling run-on and run-off. Containment of potential sources by a slurry cut-off wall intercepting the silty clay layer underlying the burial sites would also reduce the potential for the soil to act as a continuing source of ground-water contamination. Compressed gas cylinders would be excavated, tested, and removed from DDOU.
4. **On-Site Mechanical Sieving of Soil and Off-Site Disposal** - Contaminated soil and debris within each burial site would be excavated and sieved to remove debris. The excavated soil would then be analyzed and if levels of contaminants comply with cleanup standards, the soil would be returned to the excavation. Soil that does not meet cleanup standards and all debris would be removed from DDOU and disposed of at an off-site RCRA hazardous waste (Subtitle C) landfill facility or incinerated at a RCRA permitted facility. The water purification tablets would be disposed of at a RCRA industrial (Subtitle D) landfill. Compressed gas cylinders would be excavated, tested, and removed from DDOU.
5. **Off-Site Disposal** - With the exception of the water purification tablets, contaminated soil and debris within each burial site would be excavated and transported off site to a RCRA hazardous waste (Subtitle C) landfill or incinerated at an RCRA permitted facility. The water purification tablets would be disposed of at a RCRA industrial (Subtitle D) landfill. Compressed gas cylinders would be excavated, tested, and removed from DDOU.

Burial areas containing CWA, volatile organic compounds, halazone tablets, and pressurized gas cylinders are the principal threats at OU 3. Therefore, removal of soil and debris containing these materials and contaminants is the primary concern for remediation at OU 3.

**Chemical Warfare Agent Contingency Plan.** Due to the possibility that CWAs may be encountered during the OU 3 cleanup, several precautionary measures would be taken to minimize the potential for on-site worker and public exposure to these chemicals. Personnel from the U.S. Army Technical Escort Unit (TEU) who are trained in the identification and handling of CWAs would be present during all excavation activities at OU 3, including the Miscellaneous Items Burial Area, the Compressed Gas Cylinder Reburial Area, and the Water Purification Tablet Burial Area. In the event that CWA materials are encountered, all civilian personnel would leave the excavation area and TEU personnel would assume control of the site. If agent-contaminated soils are detected, TEU personnel would hand-dig and containerize the affected soil and transport it, along with any CWA material, to a Department of Defense chemical munitions disposal facility for destruction by incineration in accordance with Department of Defense regulations. The DOD chemical munitions disposal facility is designed for the destruction of the entire ordnance item and will be permitted for the destruction of lewisite and other CWAs that contain arsenic as a principle constituent. TEU would ensure that the excavation is free of CWAs and decontaminate all affected equipment before work would be allowed to resume.

Monitoring of air quality and dust suppression would be carried out at all times to protect the public and control dust emissions during site cleanup.

## 4.2 INITIAL SCREENING OF PRELIMINARY ALTERNATIVES

Preliminary alternatives were screened using three broad criteria: effectiveness, implementability, and cost. The purpose of this screening was to reduce the number of alternatives requiring a detailed analysis. Comparisons were made among those alternatives that offered similar functions or extent of remediation. Table 1 indicates how each alternative compared with the three major criteria.

The end result of the screening process was a shortened list of alternatives for remediation of soil at OU 3 that were recommended for detailed analysis. The initial screening retained those alternatives that appeared more effective, easier to implement, and less costly than other alternatives offering a similar level of protection or extent of remediation. The selected proposed remediation alternatives for OU 3 are as follows:

**Alternative 1** - No Action

**Alternative 2** - Institutional Controls

**Alternative 4** - On-Site Mechanical Sieving of Soil and Off-Site Disposal

**Alternative 5** - Off-Site Disposal

Alternative 3 was eliminated because compliance with Department of Defense ARARs regarding CWA and clean closure could not be achieved, future land use would be limited, and long-term effectiveness could not be assured.

## 4.3 DESCRIPTION OF ALTERNATIVES

To aid in tracking the selected alternatives through the detailed analysis, Alternatives 4 and 5 were renumbered as Alternatives 3 and 4. In addition, the renumbered Alternatives 3 and 4 have options for off-site disposal at a RCRA permitted landfill or at an off-site RCRA permitted incinerator. For this reason, Alternatives 3 and 4 have been further divided into Alternatives 3a and 3b and 4a and 4b, respectively. The alternatives are listed below:

Alternative 1	No Action
Alternative 2	Institutional Controls
Alternative 3a	On-Site Mechanical Sieving of Soil and Off-Site Disposal at a RCRA Permitted Landfill
Alternative 3b	On-Site Mechanical Sieving of Soil and Off-Site Disposal by Incineration
Alternative 4a	Off-Site Disposal at a RCRA Permitted Landfill
Alternative 4b	Off-Site Disposal by Incineration

### 4.3.1. Alternative 1 - No-Action

No remedial action would be taken to reduce the levels of contamination detected in soil within OU 3. Therefore, Alternative 1 does not reduce the risk to human health and the environment. A no-action alternative is not required to comply with ARARs. The indirect, capital, operating, and maintenance costs associated with this alternative are presented in Table 2, as are estimates of net present worth costs based on a statutory review every five years.

**TABLE 1**  
**SCREENING SUMMARY FOR OU 3 SOIL REMEDIATION ALTERNATIVES**

<b>Alternative</b>	<b>Effectiveness</b>	<b>Implement- ability</b>	<b>Cost</b>	<b>Selected</b>	<b>Comments</b>
<b>1. No Action</b>	<b>Poor</b>	<b>Excellent</b>	<b>Excellent</b>	<b>Yes</b>	<b>Represents baseline case for comparison. Does not prevent continued contamination of ground water.</b>
<b>2. Institutional Controls</b>	<b>Poor</b>	<b>Excellent</b>	<b>Good</b>	<b>Yes</b>	<b>Affords non-invasive exposure control. Potentially applicable to some burial areas. Does not prevent continued contamination of ground water.</b>
3. Containment (Slurry Wall and Cap)	Fair	Good	Poor	No	May not provide an effective long-term solution. Clean closure is not achieved.
<b>4. On-Site Mechanical Sieving of Soil and Off-Site Disposal</b>	<b>Good</b>	<b>Good</b>	<b>Fair</b>	<b>Yes</b>	<b>Eliminates the potential source areas. Is cost effective and would allow clean closure.</b>
<b>5. Off-Site Disposal</b>	<b>Good</b>	<b>Good</b>	<b>Poor</b>	<b>Yes</b>	<b>Eliminates the potential source areas. Would allow clean closure.</b>

Bold indicates a selected alternative.

**TABLE 2**  
**COMPARISON OF ALTERNATIVES**  
**PERFORMANCE AT INDIVIDUAL BURIAL AREAS IN OU3**

Evaluation Criteria	Alternative 1 No Action	Alternative 2 Institutional Controls	Alternative 3a On-Site Mechanical Sieving of Soil and Off- Site Disposal at a RCRA Permitted Landfill	Alternative 3b On-Site Mechanical Sieving of Soil and Off-Site Disposal by Incineration	Alternative 4a Off-Site Disposal at a RCRA Permitted Landfill	Alternative 4b Off-Site Disposal by Incineration
<b>THRESHOLD CRITERIA</b>						
<b>1. Overall Protection of Human Health and the Environment</b>						
Chemical Warfare Agent Identification Kits	Δ	O	●	●	●	●
Riot Control and Smoke Grenades	●	●	●	●	●	●
Miscellaneous Items	Δ	Δ	●	●	●	●
Water Purification Tablets	Δ	O	●	●	●	●
Compressed Gas Cylinders	Δ	●	●	●	●	●
<b>2. Compliance with ARARs</b>						
Chemical Warfare Agent Identification Kits	Not Required	Δ	●	●	●	●
Riot Control and Smoke Grenades	Not Required	●	●	●	●	●
Miscellaneous Items	Not Required	Δ	●	●	●	●
Water Purification Tablets	Not Required	●	●	●	●	●
Compressed Gas Cylinders	Not Required	●	●	●	●	●
<b>BALANCING CRITERIA</b>						
<b>3. Long-Term Effectiveness and Permanence</b>						
Chemical Warfare Agent Identification Kits	Δ	O	●	●	●	●
Riot Control and Smoke Grenades	Δ	O	●	●	●	●
Miscellaneous Items	Δ	Δ	O	O	●	●

- Meets criterion.
- O Partially meets criterion.
- Δ Does not meet criterion.

NA Not Applicable



**TABLE 2**  
**COMPARISON OF ALTERNATIVES**  
**PERFORMANCE AT INDIVIDUAL BURIAL AREAS IN OU3**  
**(CONTINUED)**

Evaluation Criteria	Alternative 1 No Action	Alternative 2 Institutional Controls	Alternative 3a On-Site Mechanical Sieving of Soil and Off- Site Disposal at a RCRA Permitted Landfill	Alternative 3b On-Site Mechanical Sieving of Soil and Off-Site Disposal by Incineration	Alternative 4a Off-Site Disposal at a RCRA Permitted Landfill	Alternative 4b Off-Site Disposal by Incineration
Water Purification Tablets	Δ	O	●	●	●	●
Compressed Gas Cylinders	Δ	●	●	●	●	●
<b>4. Reduction in Mobility, Toxicity, and Volume</b>						
Chemical Warfare Agent Identification Kits	Δ	Δ	O	O	O	O
Riot Control and Smoke Grenades	Δ	Δ	O	●	O	●
Miscellaneous Items	Δ	Δ	O	●	O	●
Water Purification Tablets	Δ	Δ	●	●	●	●
Compressed Gas Cylinders	Δ	●	●	●	●	●
<b>5. Short-Term Effectiveness</b>						
Chemical Warfare Agent Identification Kits	●	●	●	●	●	●
Riot Control and Smoke Grenades	●	●	●	●	●	●
Miscellaneous Items	●	●	●	●	●	●
Water Purification Tablets	●	●	●	●	●	●
Compressed Gas Cylinders	●	●	●	●	●	●
<b>6a. Implementability (Technical)</b>						
Chemical Warfare Agent Identification Kits	●	●	●	●	●	●
Riot Control and Smoke Greandes	●	●	●	●	●	●

- Meets criterion.  
O Partially meets criterion.  
Δ Does not meet criterion.
- NA Not Applicable

**TABLE 2**  
**COMPARISON OF ALTERNATIVES**  
**PERFORMANCE AT INDIVIDUAL BURIAL AREAS IN OU3**  
**(CONTINUED)**

<b>Evaluation Criteria</b>	<b>Alternative 1 No Action</b>	<b>Alternative 2 Institutional Controls</b>	<b>Alternative 3a On-Site Mechanical Sieving of Soil and Off- Site Disposal at a RCRA Permitted Landfill</b>	<b>Alternative 3b On-Site Mechanical Sieving of Soil and Off-Site Disposal by Incineration</b>	<b>Alternative 4a Off-Site Disposal at a RCRA Permitted Landfill</b>	<b>Alternative 4b Off-Site Disposal by Incineration</b>
Miscellaneous Items	●	●	●	●	●	●
Water Purification Tablets	●	●	●	●	●	●
Compressed Gas Cylinders	●	●	O	O	O	O
<b>6b. Implementability (Administrative)</b>						
Chemical Warfare Agent Identification Kits	●	●	O	O	O	O
Riot Control and Smoke Grenades	●	●	O	O	O	O
Miscellaneous Items	●	●	●	●	●	●
Water Purification Tablets	●	●	●	●	●	●
Compressed Gas Cylinders	●	●	●	●	●	●
<b>7. Cost</b>						
Current Present Worth	\$0	\$150,000	\$362,000	\$570,000	\$410,000	\$1,792,000
5-Year Present Worth	\$3,920	\$165,000	NA	NA	NA	NA
10-Year Present Worth	\$6,990	\$184,000	NA	NA	NA	NA
20-Year Present Worth	\$11,300	\$201,000	NA	NA	NA	NA
<b>8. State Acceptance</b>	Δ	O	●	●	●	●
<b>9. Community Acceptance</b>	Δ	O	●	●	●	●

● Meets criterion.  
O Partially meets criterion.  
Δ Does not meet criterion.

NA Not Applicable

#### **4.3.2 Alternative 2 - Institutional Controls**

Modifications, in the property deeds and facilities drawings would be made to provide information regarding the presence of hazardous materials in the soils at Burial Site 3-A. Perimeter fencing would be periodically inspected, and site access would continue to be restricted. Compressed gas cylinders would be excavated and disposed of off site and no other materials or debris would be removed from the site.

This alternative does not comply with the State of Utah regulation R450-101 because contaminants detected in the Miscellaneous Items Burial Area are a source of contamination at OU 3. The regulation requires that any corrective action at a RCRA, CERCLA, or UST site begin with elimination of the source(s) of contamination through removal or control. Also, since the CWA Identification Kit and Miscellaneous Items burial areas may contribute to cross-media contamination, the State of Utah Ground-Water Protection Statute (R448-6) would be violated. In the event of the sale of land at OU 3 in the future, the requirements of CERCLA section 120(h) would have to be complied with.

The indirect, capital, operating and maintenance costs associated with this alternative are presented in Table 2, as are estimates of present net worth costs based on a 20-year monitoring period and a statutory review every five years.

#### **4.3.3. Alternative 3a - On-Site Mechanical Sieving of Soil and Off-Site Disposal at a RCRA Permitted Landfill**

Each burial area within OU 3 would be excavated individually, and the buried debris would be removed from the soil by hand sorting and/or mechanical sieving. Debris is considered to be any buried material other than soil, rock, or vegetation. Excavation would proceed in each burial area until the following criteria are achieved in the soils forming the perimeter of the excavation:

- Removal of all debris encountered during excavation.
- Removal of all visually contaminated soil.
- Removal of soil and debris with contaminants that pose a cancer risk under a residential ingestion scenario greater than one in ten thousand, with a target risk of one in one million, wherever practicable. Contaminant concentrations associated with a cancer risk of one in ten thousand are specified in Appendix A.
- Removal of soil and debris with contaminants at concentrations corresponding to a hazard index greater than one under a residential ingestion scenario. Contaminant concentrations required to meet this criterion are specified in Appendix A.
- Removal of soil and debris with detectable CWA contamination in accordance with the CWA Contingency Plan.
- Removal of all water purification tablet bottles.

Excavated soil that has been separated from the debris would be stockpiled and tested for compliance with the cleanup standards specified above and toxicity characteristic leaching procedure (TCLP) criteria for toxic characteristics. To ensure compliance with

the RCRA land disposal restrictions (LDRs), the soil from each burial area excavation would be subjected to tests that relate to the contaminants found in that particular burial area. Soil that passes the cleanup criteria would be replaced in the excavations.

Soil that fails the cleanup criteria defined above, or contains RCRA listed or characteristic hazardous wastes, would be transported off site, treated if necessary using stabilization/fixation or some other method that complies with LDRs, and disposed of in a RCRA hazardous waste (Subtitle C) landfill. Screened debris would also be tested for hazardous characteristics using TCLP to ensure correct waste classification, and transported, along with soil that fails the cleanup criteria, to the RCRA landfill disposal facility. Water purification tablet bottles would be disposed of at a RCRA industrial (Subtitle D) landfill because they are neither a listed hazardous nor characteristic waste. Compressed gas cylinders would be excavated and disposed of off site.

Any CWAs encountered in soil or debris during implementation of Alternative 3a would be excavated, transported, and disposed of by certified DOD personnel according to the CWA Contingency Plan described in Section 4.1. Materials contaminated by CWAs would be transported to a DOD disposal facility for deactivation by incineration. This action would be implemented only if CWAs are encountered. No CWA contaminated materials would be transported to or disposed of at a non-military commercial facility.

Because the sources of contamination would be removed from OU 3 by implementation of Alternative 3a, ARARs regarding source control would be met at each burial area. These ARARs include Utah Administrative Code (UAC) R450-101, which requires removal or control of sources involved in corrective actions under CERCLA, and R448-6, which would impose discharge and ground-water monitoring requirements in the absence of source control. Land disposal restrictions would be met by testing soil using TCLP, and treating soil that does not pass this test at the landfill facility. Permit requirements for VOC emissions of 1.5 tons per year under the Utah Air Conservation Rules would not be applicable as there are less than 1.5 tons of VOCs buried within OU 3. The congressional mandate regarding the disposal of CWAs and CWA-contaminated materials by incineration is met by the CWA Contingency Plan. All other ARARs listed in Appendix C would also be met.

The costs associated with Alternative 3a are listed in Table 2. The area of attainment for each burial area and cleanup levels are listed in Table 3. The estimated remediation time frame for this alternative is less than one year.

#### **4.3.4. Alternative 3b - On-Site Mechanical Sieving of Soil and Off-Site Disposal by Incineration**

Alternative 3b is identical to Alternative 3a except that all separated debris and contaminated soil would be transported off site for incineration at a permitted RCRA incinerator instead of to a RCRA landfill. Water purification tablet bottles would be disposed of at a RCRA industrial (Subtitle D) landfill because they are neither a listed hazardous nor characteristic waste. Compressed gas cylinders would be excavated and disposed of off site.

Any CWAs encountered in soil or debris during implementation of Alternative 3b would be excavated, transported, and disposed of by certified DOD personnel according to the CWA Contingency Plan described in Section 4.1. Contaminated materials would be transported to a DOD disposal facility for deactivation by incineration. This action would

**TABLE 3**  
**CLEANUP LEVELS AND AREAS OF ATTAINMENT FOR OUR 3 BURIAL SITES**

Burial Area	Nature of Buried Items	Type of Contaminants	Cleanup Level	Area of Attainment
Chemical Warfare Agent Identification Kit Burial Area	Vials of chemical warfare agents, broken glass	CWAs BNAEs Metals	Non Detection Health Based <sup>(a)</sup> Health Based <sup>(a)</sup>	100 cubic yards
Riot Control and Smoke Grenade Burial Area	Decomposing grenades and wire bundles	BNAEs Metals	Health Based <sup>(a)</sup> Health Based <sup>(a)</sup>	90 cubic yards
Miscellaneous Items Burial Area	Lead foil covered test kits, air purification canisters, containers of VOCs and unknown organic compounds, and other items	VOCs Metals	Health Based <sup>(a)</sup> Health Based <sup>(a)</sup>	230 cubic yards
Water Purification Tablet Burial Area	Thousands of small glass jars containing halazone tablets	None	Removal	110 cubic yards
Compressed Gas Cylinder Reburial Area	Several cylinders of compressed gas	Unknown	Removal	NE
				<b>530 cubic yards</b>

NE Not estimated  
 CWAs Chemical Warfare Agents  
 VOCs Volatile Organic Compounds  
 BNAEs Base, Neutral, or Acid Extractables (semi-volatile organic compounds)

(a) Health Based - Reduce potential cancer risks due to exposure to contaminants by ingestion by future residents to less than one in ten thousand with a target of one in one million, and reduce the hazard index under this exposure scenario to less than one (see Table A-1 for cleanup levels).

be implemented only if CWAs are encountered. No CWA contaminated materials would be transported to or disposed of at a non-military commercial facility.

ARARs of concern are the same as those described under Alternative 3a, except that LDRs would not apply. The costs associated with Alternative 3b are listed in Table 2. The area of attainment for each burial area and cleanup levels are listed in Table 3. The estimated remediation time frame for Alternative 3b would be less than one year.

#### **4.3.5. Alternative 4a - Off-Site Disposal at a RCRA Permitted Landfill**

Alternative 4a differs from Alternative 3a in that under Alternative 3a all debris and only soil that fails cleanup criteria would be transported off site for disposal and clean soil would be returned to the excavation. Under Alternative 4a, all soil and debris excavated from the burial areas within OU 3 would be excavated and transported off site for disposal. Determination of the extent of excavation in each burial area would be made using the methodology outlined for Alternative 3a in Section 4.3.3.

Under Alternative 4a, all soil and debris excavated from OU 3 burial areas would be transported to an off-site RCRA permitted, landfill for treatment, if necessary, and disposal. Most of the soil and debris, including all soil from the CWA Identification Kit Burial Area that does not contain CWAs, would be placed in a RCRA hazardous waste (Subtitle C) landfill. Laboratory analyses of soil samples, including TCLP testing, would be performed to determine if treatment is necessary prior to disposal. Because the water purification tablet bottles are not a listed hazardous or characteristic waste, they would be disposed of in a RCRA industrial (Subtitle D) landfill. Compressed gas cylinders would be excavated and disposed of off site by a commercial operator.

Any CWA-contaminated soil or debris encountered would be excavated, transported, and disposed of by certified DOD personnel as described in the CWA Contingency Plan (Section 4.1).

The ARARs of concern under Alternative 4a are the same as those described for Alternative 3a. The costs associated with Alternative 4a are listed in Table 2. The area of attainment for each burial area and the cleanup levels are listed in Table 3. The estimated remediation time frame would be less than one year for Alternative 4a.

#### **4.3.6. Alternative 4b - Off-Site Disposal by Incineration**

Alternative 4b is identical to Alternative 4a except that the soil and debris would be transported off site for incineration at a permitted RCRA incinerator instead of to a RCRA permitted landfill. Because the water purification tablet bottles are not a listed hazardous or characteristic waste, they would be disposed of in a RCRA industrial (Subtitle D) landfill. The compressed gas cylinders would be excavated and disposed of off-site by a commercial operator.

Any CWA-contaminated soil or debris encountered would be excavated, transported, and disposed of by certified DOD personnel as described in the CWA Contingency Plan (Section 4.1).

The ARARs of concern under Alternative 4b are the same as those described for Alternative 3a, except that the LDRs would not apply. The costs associated with Alternative 4b are listed in Table 2. The area of attainment for each burial area and the cleanup levels

are listed in Table 3. The estimated remediation time frame would be less than one year for Alternative 4b.

#### **4.4 COMPARATIVE ANALYSIS OF REMEDIATION ALTERNATIVES**

During the detailed analysis of remediation alternatives for OU 3, each alternative was assessed using the nine evaluation criteria defined under the NCP. These criteria were developed to address the technical and policy considerations that have proven important for selecting among remedial alternatives and serve as the basis for the detailed, analysis, assessment, and the final selection of an appropriate remedial action. To be an appropriate remedial action, an alternative must meet criteria 1 and 2, which are the threshold criteria. Those alternatives satisfying the threshold criteria are compared using the five balancing criteria. The final two modifying criteria can change the preferred alternative selected as a result of applying the balancing criteria. The evaluation criteria are described below.

##### **Threshold Criteria**

Threshold criteria used in the comparative analysis include overall protection of human health and the environment and compliance with ARARs. These threshold criteria must be met by an alternative before it can be evaluated under the five balancing criteria.

1. **Overall Protection of Human Health and the Environment** - The assessment against this criterion describes how the alternative, as a whole, achieves and maintains protection of human health and the environment.
2. **Compliance with ARARs** - The assessment against this criterion describes how the alternative complies with ARARs or, if a waiver is required, how it is justified. The assessment also addresses other information from advisories, criteria, and the guidance that the parties have agreed is “to be considered.”

##### **Balancing Criteria**

The five balancing criteria form the basis of the comparative analysis because they allow tradeoffs among the alternatives involving different degrees of performance.

3. **Long-term Effectiveness and Permanence** - The assessment of alternatives against this criterion evaluates the long-term effectiveness of each alternative in protecting human health and the environment after the response objectives have been met.
4. **Reduction of Mobility, Toxicity, and Volume Through Treatment** - The assessment against this criterion evaluates the anticipated performance of the specific treatment technologies an alternative may employ.
5. **Short-term Effectiveness** - The assessment against this criterion examines the effectiveness of alternatives in protecting human health and the environment during the construction and implementation of a remedy until the response objectives have been met.

6. **Implementability** - The assessment against this criterion evaluates the technical and administrative feasibility of the alternatives and the availability of the goods and services needed to implement them.
7. **Cost** - The assessment against this criterion evaluates the capital, indirect, and operation and maintenance costs of each alternative. Cost can only be a deciding factor for alternatives equally protective of human health and the environment.

#### **Modifying Criteria**

8. **State Acceptance** - This criterion reflects the State's preferences among or concerns about alternatives.
9. **Community Acceptance** - This criterion reflects the community's preferences among or concerns about alternatives.

The results of the analysis of alternatives using the nine criteria are summarized in Table 2. This summary is used to compare the alternatives and identify the key tradeoffs among them. The comparative analysis of the alternatives was then conducted to evaluate the alternatives with respect to their relative performance according to the threshold and balancing criteria. The results of this comparison are presented below.

#### **4.4.1. Overall Protection of Human Health and the Environment**

Because there are currently no exposure pathways to contaminated soil at OU 3, all the remedial alternatives are equally protective of human health and the environment if present land use at DDOU remains unchanged. Therefore, the current risks to human health are acceptable under present land use conditions for all of the alternatives.

Under Alternative 1 (no action), there would be a potential for future exposure to unacceptable concentrations of CWAs in the CWA Identification Kit Burial Area and to the contents of bottles in the Water Purification Tablet Burial Area. Because the Miscellaneous Items Burial Area is a source of ground-water contamination, the no action alternative would not be protective of ground water. In addition, a physical risk from buried compressed gas cylinders would remain. Therefore, Alternative 1 is not acceptable for use as a site-wide remedy for OU 3. However, it could be an acceptable remedy at the Riot Control and Smoke Grenade Burial Area because future health risks at this disposal site are considered acceptable.

While the risk of exposure to contaminated soil is acceptable under Alternative 2, the potential for the soil in the Miscellaneous Items Burial Area to act as a continuing source of ground-water contamination is not considered acceptable. Thus, Alternative 2 meets or partially meets the criterion at all burial areas except the Miscellaneous Items Burial Area. Alternatives 3a, 3b, 4a, and 4b would comply with this criterion at all burial areas.

#### **4.4.2. Compliance with ARARs**

The institutional controls alternative (Alternative 2) would fail to meet ARARs for control or removal of contamination sources in soil at the Miscellaneous Items Burial Area, as required under Utah Administrative Code Rule 450-101. Alternatives 3a and 4a would comply with ARARs relating to contaminant source removal, transportation, and disposal if the soil and debris meet the treatment standards and are handled according to RCRA



classifications and LDRs. If soil does not meet treatment standards, treatment by fixation/stabilization or some other method (Alternatives 3a and 4a), or incineration (Alternatives 3b and 4b) would allow LDRs to be met. Alternative 1 (no action) is not required to comply with ARARs.

#### **4.4.3. Long-Term Effectiveness and Permanence**

The no-action alternative (Alternative 1) would provide the least compliance with this criterion, failing at all burial areas. The institutional controls alternative (Alternative 2) also rates lower than the alternatives that remove contaminated debris and soil from the site (Alternatives 3a, 3b, 4a, and 4b). However, the restriction of site access under Alternative 2 gives it a higher rating than the no action alternative. The permanence of fixation/stabilization and landfilling contaminated debris and soils under Alternatives 3a and 4a rates these alternatives higher than Alternatives 1 and 2. However, in the Miscellaneous Items Burial Area, the relatively high analytical detection limits of contaminants in soil implies that soil reburied under Alternative 3a could still act as a source of ground-water contamination. While Alternative 3b rates higher than Alternative 3a in the Miscellaneous Items Burial Area due to the complete destruction afforded by incineration, it rates lower than Alternative 4a due to the potential for continuing ground-water contamination. Alternative 4b carries the highest rating in this area because all soil and debris would be incinerated. In the CWA Identification Kit Burial Area, arsenic is the contaminant of greatest concern, except for CWAs, which require incineration at a DOD facility. Because incineration of arsenic would not result in destruction, small amounts of uncontrolled arsenic emissions may escape through the stack; thus, Alternatives 3a and 4a rate slightly higher than Alternatives 3b and 4b in this area. Alternatives 3b and 4b rate slightly higher than Alternatives 3a and 4a for the Riot Control and Smoke Grenade Burial Area because the alternatives requiring incineration are more effective and permanent if significant contamination is present. However, no contamination has been identified that would pose an unacceptable health threat in this area. Alternatives 3a, 3b, 4a, and 4b address the compressed gas cylinders and the water purification tablets identically.

#### **4.4.4. Reduction in Mobility, Toxicity, and Volume**

Alternatives 1 and 2 rate lowest against this criterion because no action or limited action would be taken to remediate contamination sources. Alternatives 3a and 4a partially meet this criterion because the mobility of contaminants would be reduced by removing them from all burial areas in OU 3 and placing them in a RCRA permitted landfill and in the case of Alternative 3a, volume would be reduced by separating contaminated soil from uncontaminated soil. However toxicity would not be reduced without additional treatment. Treatment by incineration under Alternatives 3b and 4b would reduce toxicity, mobility, and volume in the Miscellaneous Items Burial Area. These alternatives would also reduce toxicity, mobility, and volume in the Riot Control and Smoke Grenade Burial Area if there is undetected contamination in this area. However, these alternatives will not reduce the toxicity of arsenic in the CWA Identification Kit Burial Area, and may slightly increase its mobility and volume through losses in the incinerator stack.

#### **4.4.5. Short-Term Effectiveness**

Both the no-action and the institutional controls alternatives achieve a high rating under this criterion because with no excavation, or limited excavation, there is little or no risk to on-site workers or the community. The other alternatives compare equally with a high

rating at all burial areas under this criterion if the CWA Contingency Plan described in Section 4.1 is implemented during the remediation activities.

#### **4.4.6. Implementability**

Although all of the alternatives are both technically and administratively implementable, some have more technical or administrative requirements than others. The no-action alternative is the easiest to implement technically and has been given the highest rating (Table 2). Alternatives 2, 3a, 3b, 4a, and 4b include recovering, sampling, and disposing of the compressed gas cylinders, which is more difficult to implement technically, but is a technology that is commercially available. Alternative 2 has also been given a high rating because in addition to removing the compressed gas cylinders, it would initially require only an inspection and reporting program. Alternatives 3a, 3b, 4a, and 4b would require coordination with the U.S. Army Technical Escort Unit for handling and disposal of CWAs, a construction contractor, and coordination with a commercial disposal facility. In addition, because the U.S. Army is currently in the process of revising policies and procedures for the removal, handling, and disposal of CWAs and CWA-contaminated soil, until the procedural issues are resolved, remediation of sites contaminated with CWAs cannot proceed. However, assuming the Army finalizes the procedural issues, none of Alternatives 3a, 3b, 4a, or 4b, present prohibitively difficult problems with regard to technical, administrative, or equipment-related implementability. For this reason, these alternatives have been given a moderate rating.

#### **4.4.7. Cost**

Costs for each of the remedial alternatives have been tabulated in Table 2. The no-action alternative (Alternative 1) has a total present worth cost of \$11,300 to prepare four five-year site review reports at the end of the 5th, 10th, 15th, and 20th years. Of the other alternatives, Alternative 2 (institutional controls), with a present worth of \$201,000 for the first 20 years of controls, has the lowest costs. Alternative 3a (on-site treatment and off-site disposal) has a total one-year cost of \$362,000. Alternative 3b, which includes incineration, has a total one-year cost of \$570,000. Alternative 4a (off-site disposal) has a one-year cost estimated at \$450,000, and Alternative 4b, which includes incineration, has the highest cost with a one-year cost estimated at \$1,792,000.

#### **4.4.8. State Acceptance**

The State has been involved in each step of the RI/FS process and the presentation of the preferred alternative in the Proposed Plan for OU 3. Therefore, this criterion has been addressed in the development of the remedy for OU 3. The State is supportive of the selected remedy.

#### **4.4.9. Community Acceptance**

Community acceptance is implicitly analyzed for the selected remedy in the Responsiveness Summary at the end of this document. All comments received during the public comment period have been addressed and the alternatives altered if necessary. Therefore, public concerns regarding the selection of a remedy for OU 3 have been addressed.

## 5.0 SELECTED REMEDY

Because the nature of the items and chemical contaminants present in the OU 3 burial areas varies greatly, it was determined that no single remedial action alternative was suitable for all burial areas. The selected remedy consists of the two alternatives presented here that provide the best balance of trade-offs with respect to the nine evaluation criteria listed in Section 4.4. The selected remedy for Operable Unit 3 is a combination of **Alternative 3a**, on-site mechanical sieving of soil and debris and off site disposal at a RCRA permitted landfill for the **CWA Identification Kit and Riot Control and Smoke Grenade** burial areas, and **Alternative 4a**, off-site disposal of soil and debris at a RCRA permitted landfill for the **Miscellaneous Items, Water Purification Tablet**, and the **Compressed Gas Cylinder** burial areas. Under both alternatives, any soil or debris containing CWAs will be taken off site to a licensed DOD chemical munitions disposal facility for destruction by incineration in accordance with DOD regulations. The only difference between Alternative 3a and Alternative 4a is that under Alternative 4a, soil and debris will not be sorted, and no soil would be returned to the excavations. This remedy was presented as the preferred alternative in the Proposed Plan for OU 3 and has the support of the State and EPA. Because the State has been intimately involved in the RI/FS process at OU 3, State acceptance of the selected remedy has been achieved through incorporation of State comments on primary documents prepared in support of this ROD, and included in the Administrative Record. Community acceptance of the selected remedy has been achieved through the Community Relations Program, public meetings, and the public comment period. A detailed description of the selected alternative, including the remediation goals, cleanup levels, and the costs associated with each component of the remedy is presented in the following discussion.

### 5.1 DESCRIPTION OF THE SELECTED REMEDY

Alternative 3a will be implemented at the CWA Identification Kit and Riot Control and Smoke Grenade burial areas. Alternative 4a will be implemented in the Miscellaneous Items, the Water Purification Tablet, and the Compressed Gas Cylinder burial areas. Each burial site will be excavated using a track-mounted backhoe operated by specially trained personnel. The extent of excavation will be determined using the following cleanup criteria:

- Removal of all debris encountered during excavation.
- Removal of all visually contaminated soils.
- Removal of soil and debris with contaminants that pose a cancer risk under a residential ingestion scenario greater than one in ten thousand, with a target risk of one in one million, wherever practicable. Contaminant concentrations associated with a cancer risk of one in ten thousand are specified in Appendix A.
- Removal of soil and debris with contaminants at concentrations corresponding to a hazard index greater than one under a residential ingestion scenario. Contaminant concentrations required to meet this criterion are specified in Appendix A.

- Removal of soil and debris with detectable CWA contamination in accordance with the CWA Contingency Plan.
- Removal of all water purification tablet bottles.

Excavation will proceed in each burial area until the cleanup criteria listed above are achieved in the soils forming the perimeter of the excavation. Debris will be separated from the soil in the CWA Identification Kit and Riot Control and Smoke Grenade Burial Areas by a combination of hand and vibratory sorting using a mechanical soil shaker screen. Any containers of CWAs, riot control or smoke grenade fragments, and CWA-contaminated soil or debris encountered will be transported off site and disposed of by incineration at a Department of Defense facility, as described in the CWA Contingency Plan (Section 4.1). Chemical warfare agent or grenade contaminated material will not be transported to, or disposed of at a non-military facility. The total area of attainment calculated by summation of the individual burial areas is 530 cubic yards (Table 3).

Soil that is not contaminated by CWAs will be tested for compliance with the Toxicity Characteristics Leaching Procedure (TCLP) criteria for toxic characteristics to determine if they are hazardous. The soil in the CWA Identification Kit and Riot Control and Smoke Grenade Burial Areas will also be tested for semi-volatile organic and metals contamination to determine compliance with cleanup criteria.

If the screened soil exceeds the cleanup criteria listed in Appendix A, or is a RCRA listed or characteristic waste, the soil will be transported to an off-site RCRA hazardous waste (Subtitle C) landfill for disposal. Soil and debris that contain listed hazardous wastes above RCRA treatment standards or exhibit hazardous characteristics using TCLP criteria will be treated prior to disposal by the RCRA facility. The water purification tablets will be disposed of in a RCRA (Subtitle D) industrial landfill.

Soil that meets the cleanup criteria will be replaced in the excavation in the CWA Identification Kit and Riot Control and Smoke Grenade Burial Areas. Determination of whether the material complies with the cleanup criteria will be based on a statistical analysis performed on a representative number of samples of the stockpiled material. Compliance monitoring is discussed in detail in Appendix B of this document.

The Compressed Gas Cylinder Reburial Area will be excavated, the compressed gas cylinders recovered, sampled, and the gas contents disposed of by a civilian contractor. Empty cylinders will be disposed of by recycling.

#### **5.1.1. Remediation Goals**

The point of compliance for soil will be removal of all soil and debris from the CWA Identification Kit, Riot Control and Smoke Grenade, Miscellaneous Items, Water Purification Tablet, and Compressed Gas Cylinder burial areas. The extent or volume of soil to be removed will be determined by the cleanup criteria listed in Section 5.1.

During the excavation process, excavated soil and debris will be tested using the Toxicity Characteristics Leaching Procedure (TCLP) for compliance with treatment standards for volatile organic compounds, semi volatile organic compounds, and metals. Soil from the CWA Identification Kit and Riot Control and Smoke Grenade burial areas will also be tested for total metals and semi volatile organic compounds. The type of TCLP test that is used will depend on the burial site from which the soil is excavated. Table 2 lists the individual burial sites and the contaminants previously detected within each area. The

frequency of TCLP testing will be no less than three samples for every burial area. This test will ensure proper characterization of the material so that the landfill receiving the material can determine if treatment will be necessary before landfill disposal.

### **5.1.2. Costs**

Total project costs should be approximately \$393,000 using a combination of costs from Alternatives 3a and 4a for remediation of the five burial areas. Indirect costs for administration, engineering, and design services were estimated to be approximately one-third of the total project costs. There are no annual operation and maintenance costs because the remediation of OU 3 should take less than one year.

## **5.2 STATUTORY DETERMINATIONS**

With the exception of the Miscellaneous Items Burial Area, the selected remedy for OU 3 meets the statutory requirements of Section 121 of CERCLA as amended by SARA. These statutory requirements include protection of human health and the environment, compliance with ARARs, cost effectiveness, utilization of permanent solutions and alternative treatment technologies to the maximum extent practicable, and preference for treatment as a principal element. The manner in which the selected remedy for OU 3 meets (or the reason for not meeting) each of the statutory requirements is presented in the following discussion.

### **5.2.1. Protection of Human Health and the Environment**

**The selected remedy for OU 3 protects human health and the environment through the following engineering controls:**

- **Excavation of all contaminated soil and debris from the various burial areas at OU 3 and removal of all soil and debris necessary to comply with the cleanup criteria defined in Section 5.1.**
- **Excavation and removal of all soil and debris in areas where there is an obvious threat to ground water.**

Removal of the soil and debris in the various burial areas of OU 3 will eliminate potential sources of ground-water contamination and remove the potential for exposure to the contaminants found in it. The selected remedies for soil at OU 3 will not pose an unacceptable short-term risk. They will have the effect of minimizing cross-media impacts.

### **5.2.2. Compliance with Legally Applicable or Relevant and Appropriate Requirements**

Section 121(d)(1) of CERCLA, as amended by SARA, requires that remedial actions must attain a degree of cleanup that assures protection of human health and the environment. In addition, remedial actions that leave any hazardous substances, pollutants, or contaminants on site must, upon completion, meet a level or standard that at least attains legally applicable or relevant and appropriate standards, requirements, limitations, or criteria that are "applicable or relevant and appropriate requirements" (ARARs) under the circumstances of the release. ARARs include Federal standards, requirements, criteria, and limitations and any promulgated standards, requirements, criteria, or limitations under State environmental or facility siting regulations that are more stringent than Federal standards.

The remedial action proposed, the hazardous substances (including possible CWA) present at the site, the physical characteristics of the site, and the potential receptor population, were all considered when determining which requirements are applicable or relevant and appropriate to the selected remedy for OU 3. The only State regulations identified that required more stringent requirements than equivalent Federal regulations were the source control requirements of Utah Administrative Code (UAC) Rule 450-101.

Through careful review of all applicable or relevant and appropriate public health and environmental requirements of Federal or State laws, it has been determined that the remedy selected for OU 3 will meet these ARARs. Therefore, no SARA Section 121(d)(4) waiver will be necessary. A brief discussion of how the selected remedy for OU 3 satisfies the principal ARARs associated with the site is presented below.

### **5.2.3. Chemical-Specific Requirements**

Chemical-specific ARARs set health- or risk-based concentration limits in various environmental media. The Utah Corrective Action Cleanup Standards Policy is applicable to the site, and will be complied with by removing the source of ground-water contamination. The contingency for incinerating all CWAs and CWA-contaminated materials will comply with the congressional mandate under which incineration is the only approved method of chemical agent disposal. The land disposal restrictions under RCRA will be complied with by treating all soil and debris that fails TCLP tests. Other applicable or relevant and appropriate requirements include the Department of Defense regulations for handling, transportation, and disposal of CWAs, the Occupational Safety and Health Administration (OSHA) regulations, and the Department of Transportation (DOT) hazardous material transportation regulations. Federal and State chemical-specific ARARs are presented in Tables C-1 and C-2 of Appendix C.

### **5.2.4. Location-Specific Requirements**

Location-specific ARARs set restrictions on remediation activities, depending on the location of a site or its immediate environs. The only location-specific ARAR associated with the selected remedy for OU 3 is the EPA ground-water protection strategy that establishes a ground-water classification system for protecting ground water based on its value to society, use, and vulnerability. This ARAR requires removal of the source of ground-water contamination in the Miscellaneous Items Burial Area. Because Operable Unit 3 is not located in a wetlands area or flood plain, is not a historic place, and the remedy will not affect any historic place, endangered species or habitat, regulations pertaining to these concerns are not ARARs. The Federal location specific ARARs for OU 3 are presented in Table C-3.

### **5.2.5. Action-Specific Requirements**

Performance, design, or other action-specific requirements set controls or restrictions on certain kinds of remedial activities related to management of hazardous substances, pollutants, and contaminants. The Utah Air Conservation Rules are applicable in that they require a permit to emit over 1.5 tons of VOCs per year. However, because less than 1.5 tons of VOCs are buried within OU 3, the selected remedy will comply with this ARAR. The remedy will comply with the Utah Corrective Action Cleanup Standards Policy and the Utah Groundwater Quality Protection Standards by removing the source of ground-water contamination. RCRA Land Disposal Restrictions will be complied with by treating all soil that fails a TCLP test. The Source Separation of Materials Recovery Guidelines will be complied with by recycling the compressed gas and/or cylinders if possible. Other

Federal action-specific ARARs that are relevant to the remediation activities at OU 3 include RCRA Closure Regulations, RCRA Standards for Generators and Transporters of Hazardous Waste, DOT Hazardous Material Transportation Regulations, and OSHA. Potential Federal and State action-specific ARARs are presented in Tables C-4 and C-5 of Appendix C.

#### **5.2.6. To Be Considered Requirements**

In implementing the selected remedy for OU 3, DDOU has agreed to consider requirements that are not legally binding. No “to be considered” requirements were identified for the selected remedy at OU 3.

### **5.3 COST EFFECTIVENESS**

Overall cost-effectiveness can be defined as the reduction in threat to human health and the environment per dollars expended on a remedy. The selected remedy for OU 3 is the most cost-effective alternative because it provides the maximum effectiveness proportional to cost of any of the alternatives analyzed. For all of the burial areas except the Miscellaneous Items Burial Area, the selected alternative is the least expensive alternative meeting the threshold alternative, while being nearly equal to any other alternative in terms of long-term effectiveness and permanence, reduction of toxicity, mobility, and volume through treatment, and short-term effectiveness. While Alternative 4b would have been more permanent and achieved reduction in toxicity, mobility, and volume through treatment in the Miscellaneous Items Burial Area, the cost of implementing Alternative 4b in that area would have been six to seven times that of Alternative 4a. Because the major threat associated with contaminants in the Miscellaneous Items Burial Area is cross-media contamination rather than a direct health hazard, the additional cost associated with Alternative 4b was not justifiable.

### **5.4 UTILIZATION OF PERMANENT SOLUTIONS**

This section briefly explains how the selected remedy for OU 3 provides the best balance of tradeoffs among all the alternatives using the five balancing criteria described in Section 4.4.

In the long term, incineration (Alternatives 3b and 4b) would be more effective and permanent in protecting human health and the environment in the Miscellaneous Items Burial Area than disposing of soil and debris in a RCRA permitted landfill (Alternatives 3a and 4a) because the contaminants would be completely destroyed in the incineration process. However, incineration of all of the material in this area would be six to seven times more costly than landfill disposal. All four alternatives are considered to be equally effective and permanent in the Riot Control and Smoke Grenade Burial Area, where contaminants are not known to pose a chronic health threat above health-based criteria. Alternatives 3a and 4a would be more effective and permanent in the CWA Identification Kit Burial Area because incineration would not destroy the arsenic in the soil and may lead to uncontrolled releases to the atmosphere because incineration by a commercial facility does not destroy arsenic.

In the short term, there is little risk of exposure to contaminants at OU 3 under the no action and institutional control alternatives. The other alternatives that involve excavation and off-site disposal (Alternatives 3a, 3b, 4a, and 4b) compare equally because specially trained personnel will conduct the cleanup activities.

Alternatives 3b and 4b, which involve incineration of contaminants, rate highest with regard to reduction of mobility, toxicity, and volume in the Miscellaneous Items Burial Area. However, Alternatives 3a and 4a rate highest in the CWA Identification Kit Burial Area where arsenic is the major contaminant of concern. Under Alternatives 3a and 4a, volume would be reduced (although not to the extent achieved by incineration) by separating contaminated soil from uncontaminated soil. Alternatives 3a and 4a are equivalent to Alternatives 3b and 4b if CWAs are encountered during excavation because contaminants would be removed and destroyed by incineration according to the CWA Contingency Plan. At the Riot Control and Smoke Grenade Burial Area, only a small reduction of toxicity and volume would be achieved by incineration because there is estimated to be less than one cubic yard of contaminated soil in this area, and the contaminants detected are not known to be present above health-based levels. All of the alternatives are both technically and administratively implementable.

In summary, Alternatives 3a, 3b, 4a, and 4b, which involve excavation and off-site disposal of soil and debris from the OU 3 burial sites, provide the most permanent solutions for remediation of the contaminants found at OU 3, when compared with alternatives that involve no removal actions (Alternatives 1 and 2). Alternative 3a offers the most permanent solution for the CWA Identification Kit Burial Area and is also the least expensive method of remediating this area. Alternatives 3a, 3b, 4a, and 4b are comparable in terms of the balancing criteria for the Riot Control and Smoke Grenade Burial Area, as there is no known threat above health-based levels in this area. Alternative 3a is the least expensive remedial alternative among the four permanent treatment alternatives for this area, and was therefore selected. In the Miscellaneous Items Burial Area, only Alternatives 4a and 4b provided guaranteed long-term effectiveness in terms of prevention of future ground-water contamination. While Alternative 4b is more protective, Alternative 4a was selected because the soil in the Miscellaneous Items Burial Area causes no direct threat to human health or the environment. In addition, Alternative 4a is less expensive than Alternative 4b by a factor of six to seven while still providing long-term protection to human health and the environment, limited short-term risks, a reduction in mobility, toxicity, and volume, and can be relatively easily implemented. Alternatives 3a, 3b, 4a, and 4b are identical with respect to the Compressed Gas Cylinder Reburial Area and the Water Purification Tablet Burial Area.

## **5.5 PREFERENCE FOR TREATMENT AS A PRINCIPLE ELEMENT**

With the exception of the Miscellaneous Items Burial Area, the selected remedy for OU 3 utilizes permanent solutions and treatment technologies to the maximum extent practicable. Treatment of soil before disposal in an off-site RCRA (Subtitle C) landfill will be undertaken only if necessary to comply with RCRA Land Disposal Restrictions. If CWAs are detected during the excavation activities, the materials will be destroyed by incineration following guidelines outlined in the CWA Contingency Plan (Section 4.1).

## **5.6 DOCUMENTATION OF NO SIGNIFICANT CHANGES**

The Proposed Plan for OU 3 was released for public comment in March 1992 and identified the preferred alternative as a combination of Alternatives 3a and 4a for remediation of the burial sites at OU 3. All written and verbal comments submitted during the public comment period were reviewed. The conclusion of this review was that no significant changes to the preferred alternative were necessary prior to it becoming the selected remedy.



**APPENDIX A**

**SOIL REMEDIATION CRITERIA**

## APPENDIX A

### SOIL REMEDIATION CRITERIA

This appendix describes the remediation criteria for soil at Operable Unit 3 (OU 3). Confirmation soil samples will be collected after removing debris and visibly contaminated soil from the Chemical Warfare Agent Identification Kit, Riot Control and Smoke Grenade, and Miscellaneous Items burial areas. Results of these sample analyses will be used to confirm that all material contaminated above the cleanup levels has been removed from the excavation.

#### Soil Remediation Criteria

Contaminants of concern for soil remediation include the Chemical Warfare Agents (CWAs) and CWA-related compounds including adamsite, chloroacetophenone, chloropicrin, lewisite, mustard, phosgene, and thiodiglycol. The remediation criteria for these compounds is the analytical detection limit. Other contaminants of concern include arsenic, mercury, N-nitrosodiphenylamine, 1,1,2,2-tetrachloroethane, and trichloroethene (TCE). Remediation criteria for TCE, N-nitrosodiphenylamine, and 1,1,2,2-tetrachloroethane of 490, 1,250, and 30 mg/kg, respectively, correspond to cancer risks of  $1 \times 10^{-5}$  under a future residential soil ingestion scenario. The remediation criteria for mercury is 2 mg/kg, which corresponds to a hazard quotient of 0.1 under this scenario. The criterion for arsenic of 35 mg/kg corresponds to a cancer risk of  $1 \times 10^{-4}$ . An arsenic concentration that corresponds to a potential cancer risk of  $1 \times 10^{-5}$  (3.5 mg/kg) is not practical at OU 3 because that concentration would be below naturally occurring background concentrations present at DDOU, whereas, the proposed criterion can be clearly distinguished from background levels. Other contaminants listed as contaminants of potential concern in Section 3.2.1. (barium, lead, and zinc) are not included in Table A-1 because they were not detected at concentrations above health-based levels.

Risks for soil contaminants were calculated under a residential ingestion scenario where a person was assumed to be exposed as a 15 kg child ingesting 200 mg of soil per day for six years, and also as a 70 kg adult ingesting 100 mg of soil per day for 24 years. Table A-1 summarizes the remediation criteria, baseline risks, and post-remediation risks for soil contaminants.

It should be noted that the criteria for most of the contaminants of concern for soil exceed the baseline concentrations detected in soil samples collected from Burial Site 3-A. While there is no risk-based reason for remediating the soil at OU 3 for these contaminants, remediation criteria are necessary should hot spots be encountered where contaminant concentrations exceed previously detected concentrations.

**TABLE A-1**  
**SOIL REMEDIATION CRITERIA**  
**BASED ON A FUTURE RESIDENTIAL EXPOSURE SCENARIO**

<b>Chemical</b>	<b>Concentration in mg/kg/Basis</b>	<b>Base Risk/HQ</b>	<b>Clean-Up Level (mg/kg)</b>	<b>Clean-Up Risk/HQ</b>
N-nitrosodiphenylamine	0.75/Max	$6 \times 10^{-9}/\text{--}^{(a)}$	1,250	$1 \times 10^{-5}/\text{--}^{(a)}$
1,1,2,2-Tetrachloroethane	0.13/Max	$4 \times 10^{-8}/0.00006$	30	$1 \times 10^{-5}/0.01$
Trichloroethene	0.21/Max	$4 \times 10^{-9}/\text{--}^{(a)}$	490	$1 \times 10^{-5}/\text{--}^{(a)}$
Arsenic	559/Max	$2 \times 10^{-3}/7$	35	$1 \times 10^{-4}/0.5$
Mercury	9.8/Max	NC/0.4	2	NC/0.1

(a) No reference dose or slope factor available to calculate the hazard quotient or cancer risk

HQ Hazard quotient

NC Noncarcinogen

Max Maximum concentration detected

**APPENDIX B**

**PERFORMANCE AND COMPLIANCE  
MONITORING PLAN**

## **APPENDIX B**

### **PERFORMANCE AND COMPLIANCE MONITORING PLAN**

#### **PERFORMANCE AND COMPLIANCE MONITORING FOR REMOVAL OF SOIL AND DEBRIS FROM OU 3 BURIAL SITES**

##### **Remediation Goals**

Remediation goals for soil are defined in Section 5.1. of the ROD.

##### **Area of Attainment**

The area of attainment for remediation goals is the soil and debris in the various burial areas depicted in Figure 2 of the ROD. The volume of soil and debris requiring remediation is approximately 530 cubic yards.

##### **Restoration Time Frame**

The restoration time frame for this action is estimated to be approximately six months after commencement of work on site, and will be completed within 15 to 21 months after the ROD is signed.

##### **Performance Standards**

Specific performance standards used to ensure attainment of the remediation goals for soil are:

- Reduce contaminant concentrations in soils within the area of attainment to comply with the remediation goals specified in Section 5.1. of the ROD
- Meet all ARARs identified in the ROD
- Separate out all soil and debris consisting of or contaminated by chemical warfare agents for incineration at a DOD facility
- The soil will be remediated in a timely manner in compliance with the selected remedy presented in the ROD to achieve remediation goals as soon as practicable.

##### **Completion of Remediation**

Remediation will be considered complete after the soil remediation goals have been attained in all samples taken from the perimeter of the excavation. Samples to be used for compliance monitoring will be specified during Remedial Design (RD) in the Performance and Compliance Monitoring Sampling Program. Sample locations will be approved by EPA and UDEQ during the RD. The number and location of samples to be taken may be modified during remediation to ensure compliance with remediation goals. Any statistical methods to average soil concentrations areally or vertically shall be specified during the RD. The guidance entitled “Methods for Evaluating the Attainment of Cleanup Standards-Volume 1: Soils and Solid Media” (EPA 230/02-89-042) will be consulted when establishing the Performance and Compliance Sampling Program.

### **Performance and Compliance Sampling Program**

A Performance and Compliance Sampling Program (PCSP) will be implemented during the remedial action to monitor performance and compliance with remediation goals. This program will be developed during the RD and will include locations of performance monitoring points within OU 3, sampling methods, analytical methods, and statistical methods for evaluating data.

### **Role of Department of Defense in the Remediation Process**

A task force was recently established under the U.S. Army Chemical Materiel Destruction Agency (USACMDA) to manage non-stockpile chemical materiel (NSCM). The NSCM mission is as follows:

Provide centralized management and direction to the DOD program for the reclamation, recovery, and disposal of non-stockpile chemical materiel to include contaminated structures or facilities in a safe and environmentally sound and cost-effective manner.

As part of the OU 3 remedial action, USACMDA will coordinate with TEU to ensure that all necessary resources are made available to facilitate cleanup of the site.

## **APPENDIX C**

### **FEDERAL AND STATE CHEMICAL, LOCATION, AND ACTION-SPECIFIC ARARs**

## **APPENDIX C**

### **FEDERAL AND STATE CHEMICAL, LOCATION, AND ACTION-SPECIFIC ARARs**

The following tables present the chemical-specific, location-specific, and action-specific applicable or relevant and appropriate requirements (ARARs) for Defense Distribution Depot Ogden, Utah Operable Unit 3.



TABLE C-1

IDENTIFICATION OF *FEDERAL* CHEMICAL-SPECIFIC ARARs

Standard, Requirement, Criterion, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate	Comment
<b>DOD Requirements for Handling, Transport, and Disposal of CSMs and CWAs</b>				
U.S. Army	(AR) 50-6	Outlines requirements for certification to work with or transport chemical agents. Also defines types and amounts of agents which fall into the chemical surety program.	Yes/---	Only certified personnel can handle or transport chemical agents.
	(AR) 50-6-1	Defines procedures for safeguarding chemical surety materials (CSMs).	Yes/---	Both lewisite and mustard are CSMs.
U.S. Army Material Command (AMC)	(AMC-R) 385-131	Safety regulations for any work involving H, HD, HT, GB, and VX.	Yes/---	Only regulatory for AMC units, but used as guidance for other organizations.
U.S. Army	Technical Manuals (TMs) and Field Manuals (FMs)			

TABLE C-1

**IDENTIFICATION OF *FEDERAL* CHEMICAL-SPECIFIC ARARs  
(CONTINUED)**

<b>Standard, Requirement, Criterion, or Limitation</b>	<b>Citation</b>	<b>Description</b>	<b>Applicable/ Relevant and Appropriate</b>	<b>Comment</b>
	TM 8-285	Treatment of Chemical Agent Casualties and Conventional Military Chemical Injuries.	Yes/---	In the event of an exposure to CSMs or CWAs this TM would be applicable.
	TM 10-227	Protective Clothing for Chemical Operations.	Yes/---	Protective clothing specified by this TM would be required of all DOD personnel.
	FM 3-5	NBC Decontamination.	Yes/---	Chemical Decontamination requirements would be applicable.
	AMC-R 385-100	AMC Safety Manual.	Yes/---	
	(AR) 700-107	Preparation of Standard Operating Procedures.	Yes/---	Preparation of SOPs for handling, transport, and disposal of CSMs are applicable.
Congressional Mandate	Public Law 91-121	Prohibits open air testing and transportation of chemical agents within the United States.	Yes/---	Applicable to any agents or agent-contaminated soils recovered at OU 3.

**TABLE C-1**  
**IDENTIFICATION OF *FEDERAL* CHEMICAL-SPECIFIC ARARs**  
**(CONTINUED)**

<b>Standard, Requirement, Criterion, or Limitation</b>	<b>Citation</b>	<b>Description</b>	<b>Applicable/ Relevant and Appropriate</b>	<b>Comment</b>
	Public Law 91-441	Prohibits disposal of chemical agents without congressional approval.	Yes/---	Incineration is the only disposal method authorized for chemical agent disposal.
<b>Solid Waste Disposal Act</b>	42 USC Sec. 6901-6987			
Identification and Listing of Hazardous Waste	40 CFR Part 261	Defines those solid wastes which are subject to regulation as hazardous wastes under 40 CFR Parts 262-265 and Parts 270, 271, 124.	No/Yes	Identifies wastes that are subject to and disposal restrictions under 40 CFR 268.
<b>Clean Air Act</b>	42 USC Sec. 7401-7642			
National Primary and Secondary Ambient Air Quality Standards	40 CFR Part 50	Establishes standards for ambient air quality to protect public health and welfare (including standards for particulate matter and lead).	No/Yes	Relevant and appropriate to any activity which might result in air emissions during the remediation actions at OU 3.
National Emission Standards for Hazardous Pollutants	40 CFR Part 61	Sets emission standards for designated hazardous pollutants.	No/Yes	Relevant and appropriate to release from compressed gas cylinders.

TABLE C-1

**IDENTIFICATION OF *FEDERAL* CHEMICAL-SPECIFIC ARARs  
(CONTINUED)**

<b>Standard, Requirement, Criterion, or Limitation</b>	<b>Citation</b>	<b>Description</b>	<b>Applicable/ Relevant and Appropriate</b>	<b>Comment</b>
<b>Occupational Safety and Health Act</b>	20 USC Sec. 651-678	Regulates worker health and safety.	Yes/---	Applicable to any activity carried out under the selected remedy.
<b>D.O.T. Hazardous Material Transportation Regulations</b>	49 CFR Parts 107, 173.329-173.331, 173.333	May regulate transportation of CWAs, CSMs, and hazardous materials.	Yes/---	Applicable to remedial actions involving off-Depot movement of CWAs, CSMs, and hazardous materials during remediation.
<b>Resource Conservation and Recovery Act</b>	Section 3004(m)	Waives prohibition of land disposal of a particular hazardous waste if levels or methods of treatment substantially reduce toxicity or likelihood of migration of hazardous constituents to minimize short and long-term threats to human health and the environment.	No/Yes	Relevant and appropriate for remedial alternatives involving landfilling of contaminated debris and soil.

TABLE C-2

IDENTIFICATION OF *STATE* CHEMICAL-SPECIFIC ARARs

Standard, Requirement, Criterion, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate	Comment
<b>Division of Solid and Hazardous Waste, Department of Environmental Quality</b>	Utah Administrative Code (U.A.C.) R450- 101	Corrective action clean-up standards policy - RCRA, UST, and CERCLA sites.	Yes/---	Lists general criteria to be considered in establishing clean-up standards. Refer to Safe Drinking Water Act and Clean Air Act.

**TABLE C-3**

**IDENTIFICATION OF *FEDERAL* CHEMICAL-SPECIFIC ARARs**

<b>Standard, Requirement, Criterion, or Limitation</b>	<b>Citation</b>	<b>Description</b>	<b>Applicable/ Relevant and Appropriate</b>	<b>Comment</b>
<b>EPA Ground-Water Protection Strategy</b>	EPA Guidance	Establishes a ground-water classification system for protection of ground water based on its value to society, use, and vulnerability.	No/Yes	Contributes to the National Primary Drinking Water Standards (MCLs) being remedial action objectives. To be considered should source removal be required.

TABLE C-4

IDENTIFICATION OF *FEDERAL ACTION-SPECIFIC ARARs*

Standard, Requirement, Criterion, or Limitation	Citation	Description	Applicable/ Relevant and Appropriate	Comment
<b>Solid Waste Disposal Act</b>	42 USC Sec. 6901-6987			
Guidelines for the Land Disposal of Solid Wastes	40 CFR Part 241	Establishes requirements and procedures for land disposal of solid wastes.	Yes/---	Applicable to landfill storage or reburial of contaminated soils.
Source Separation of Materials Recovery Guidelines	40 CFR Part 246	Establishes requirements and recommended procedures for source separation by Federal agencies of residential, commercial, and institutional solid wastes.	No/Yes	Recycling of compressed gas and/or cylinders and lead foil may be possible.
Criteria for Classification of Solid Waste Disposal Facilities and Practices	40 CFR Part 257	Establishes criteria for use in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or the environment.	Yes/---	Applicable to remedial alternatives involving landfilling of contaminated debris and soils.
Standards Applicable to Generators of Hazardous Waste	40 CFR Part 262	Establishes standards for generators of hazardous waste.	Yes/---	Applicable to landfilling of contaminated debris and soils.

TABLE C-4

**IDENTIFICATION OF *FEDERAL* ACTION-SPECIFIC ARARs  
(CONTINUED)**

<b>Standard, Requirement, Criterion, or Limitation</b>	<b>Citation</b>	<b>Description</b>	<b>Applicable/ Relevant and Appropriate</b>	<b>Comment</b>
Standards Applicable to Transporters of Hazardous Waste	40 CFR Part 263	Establishes standards which apply to persons transporting hazardous waste within the U.S. if the transportation requires a manifest under 40 CFR Part 262.	Yes/---	Applicable to transport of hazardous material off-site.
Land Disposal Restrictions	40 CFR Part 268	Identifies hazardous wastes that are restricted from land disposal.	Yes/---	Applicable to off-site land disposal of soil containing listed or characteristic hazardous waste. Relevant and appropriate for on-site disposal activities.
<b>Occupation Safety and Health Act</b>	20 USC Sec. 651-678	Regulates worker health and safety.	Yes/---	Applicable to all remedial actions carried out under the selected remedy.
<b>D.O.T. Hazardous Material Transportation Regulations</b>	49 CFR Parts 107, 171-177	Regulates transportation of hazardous materials.	Yes/---	Applicable to off-site disposal of wastes.



TABLE C-5

## IDENTIFICATION OF STATE ACTION-SPECIFIC ARARs

Department Division or Commission	Statute	Subject	Applicable/ Relevant and Appropriate	Remarks
<b>State Engineer, Department of Natural Resources</b>	U.A.C. Rule R625-4	Well drilling standards- standards for drilling and abandonment of wells.	Yes/---	Includes such requirements as performance standards for casing joints, requirements for abandoning a well, etc.
<b>Industrial Commission</b>	U.A.C. Rule R500	Utah Occupational Safety and Health Standards.	Yes/---	These rules are identical to Federal OSHA regulations.
<b>Division of Solid and Hazardous Waste, Department of Environmental Quality</b>	Title 19, Chapter 6, Utah Code Annotated	Solid Waste. Not yet codified; copy available from the Bureau of Solid and Hazardous Waste.	No/Yes	These rules govern solid waste landfills.
	U.A.C. Rule R450	Solid and Hazardous Waste.	Yes/---	R450-0, regarding spill reporting requirements, has no corresponding Federal provisions.
	U.A.C. Rule R450-101	Corrective Action Clean-up Standards Policy - RCRA, UST, and CERCLA sites.	Yes/---	Lists general criteria to be considered in establishing clean-up standards including compliance with MCLs in Safe Drinking Water Act and Clean Air Act.

**TABLE C-5**

**IDENTIFICATION OF STATE ACTION-SPECIFIC ARARs  
(CONTINUED)**

<b>Department Divison or Commission</b>	<b>Statute</b>	<b>Subject</b>	<b>Applicable/ Relevant and Appropriate</b>	<b>Remarks</b>
<b>Division of Water Quality, Department of Environmental Quality</b>	U.A.C. Rule 448-6	Goundwater Quality Protection.	Yes/---	Applicable if ground-water contamination sources in OU 3 soils are not removed.
<b>Division of Air Quality, Department of Environmental Quality</b>	U.A.C. Rule R446	Utah Air Conservation Rules.	Yes/---	Applicable for fugitive dust and VOC emissions.